IIITprep

PREPARE FULLY FOR IIIT HYDERABAD

MEMORY BASED PREVIOUS YEAR IIIT HYDERABAD SOLVED PAPERS UGEE - 2026

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PREPARE FULLY FOR IIIT HYDERABAD

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PREFACE

IIIT HYDERABAD IS THE FIRST IIIT OF INDIA. THE IIIT HYDERABAD CULTURE, RANKING, ENVIRONMENT, EDUCATION ETC HAS MADE IT TO COME IN THE LIST OF TOP INSTITUTES NOT ONLY IN INDIA BUT IN ASIA. ITS PRESTIGE IS VALUABLE. THE ATTITUDE OF ENGINEERING IS ENCOURAGED BY THIS INSTITUTE. THE IIIT HYDERABAD HAS A HUGE CAMPUS AND PLACEMENT. MANY TOP MNC LIKE COMPANIES E.G., GOOGLE, MICROSOFT, ADOBE, FACEBOOK, ETC IS APPROACHING THEM. THEIR HIGHEST PACKAGE WAS MORE THAN 40 LAKH WITH AN AVERAGE PACKAGE OF 21 LAKH HAVING ITS NIRF RANKING IN THE TOP 50. ALL THIS MEANS IT IS COMPARABLE TO IITS THEN WHY SHOULDN'T WE TRY FOR IT?

IT IS A FACT NEARLY 10 LAKH STUDENTS WILL BE IN A RACE WITH YOU IN THE JEE MAIN BUT JEE MAIN IS NOT THE END. SEEKING ADMISSION IN IIIT HYDERABAD IS MORE DIFFICULT THAN GETTING A DECENT BRANCH IN IIT BUT IIIT HYDERABAD GIVES YOU ANOTHER WAY OF ADMISSION THROUGH THE UGEE EXAM WHERE DUE TO LACK OF AWARENESS, COMPETITION IS LESS. AS A RESULT, SELECTION CHANCES ARE MORE BECAUSE SEATS ALLOTTED FOR THE UGEE MODE OF ADMISSIONS ARE ALSO MORE. A SLIGHT UNDERESTIMATING OR WRONG GUIDANCE WILL RUIN ALL YOUR PROSPECTS.

THIS BOOK SERVES THE ABOVE-CITED PURPOSE IN A PERFECT MANNER AT WHATEVER LEVEL OF PREPARATION YOU ARE BEFORE THE EXAM. THIS BOOK GIVES YOU AN ACCELERATED WAY TO MASTER THE WHOLE UGEE SYLLABUS. IT HAS BEEN PREPARED TO KEEP IN MIND THE LATEST TREND OF QUESTION AND LEVEL OF EXAM.

WE ARE SURE THAT BOOK WILL GIVE YOU A FAST WAY TO PREPARE FOR THE UGEE EXAM WITHOUT ANY OTHER SUPPORT OR GUIDANCE.

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A FEW WORDS TO UGEE ASPIRANTS

DEAR UGEE ASPIRANTS, WE HOPE THAT YOU MUST FOLLOW THIS BOOK TO GET SUCCESS IN THE UGEE EXAM WITH PASSION AND SINCERITY. THE UGEE EXAM IS A TIME BALANCING AND MANAGING EXAM. THE ONE WHO GRABS HIS HAND ON THIS WILL SUCCEED. YOUR SPEED MATTERS. IN THIS EXAM, THE PAPER SETTER TRIES TO PUT LENGTHY QUESTIONS IN BETWEEN THE PAPER. YOU DON'T HAVE TO WASTE YOUR TIME DOING IT, JUST LEAVE IT AND TRY TO SOLVE MAXIMUM QUESTIONS.

STUDENTS, UGEE IS A KEY TO SUCCESS BECAUSE MANY PEOPLE DON'T KNOW ABOUT IT THERE ARE YOU, STUDENTS WHO HAVEN'T SCORE WELL IN JEE MAIN THEY ARE STILL THERE IN IIIT HYDERABAD DUE TO UGEE THEY DON'T WANT YOUR PCM TO BE CHECKED, THEY WANT LOGICAL SKILLS, THINKING SKILLS AND YOUR PASSION REGARDING IT. HERE IN THIS BOOK, QUESTIONS ARE EASY AND FAMILIAR. TILL THEN ATTEMPT IT UP TO END. DON'T LEAVE THEM AS YOU KNOW THE LOGIC. THE EXAM NEEDS SPEED AND SPEED WILL BE ACHIEVED BY PRACTICE. TRY TO DO MOST OF THE PART ORALLY.

THIS IS A FULLY PREPARED GUIDE. THE ONE WHO PREPARES THROUGH IT HAS MORE CHANCES OF SELECTION AS MANY PEOPLE'S HAVEN'T REACHED UP TO THIS BOOK AND EXAM DUE TO UNAWARENESS. BUT HERE YOU HAVE THIS OPPORTUNITY THAT YOU KNOW THE EXAM SYLLABUS AND PATTERN. SO, TRY YOUR BEST TO ACHIEVE IT. PROVIDE YOUR VALUABLE FEEDBACK / SUGGESTION / DEMAND ON OUR WHATSAPP NUMBER 7972348944 SPECIALLY DEDICATED FOR THE UGEE ASPIRANT. FEEL FREE TO ASK ANYTHING ANYTIME.

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UGEE REAP SYLLABUS

Section A: Case Study Questions

1. Conceptual Case Study Problems
2. Graphical Questions of PCM
3. Big Passage Que based on PCM & SUPR section
4. Miscellaneous Case Study

Section B: Algebra & Geometry

1. Miscellaneous Eqn
2. Progressions & Series
3. Permutations & Combinations
4. Probability
5. Tracing Curves
6. No. of Solutions

Section C: Reasoning & Data Interpretation

1. Coding and decoding
2. Cryptarithmetic Problems
3. Miscellaneous Puzzles
4. Analytical Reasoning
5. Data Sufficiency
6. Linguistics
7. Finding the missing term

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UGEE SUPR SYLLABUS

Section A: Physics

Unit 1: Physics and Measurement
Unit 2: Kinematics
Unit 3: Laws of Motion
Unit 4: Work, Energy and Power
Unit 5: Rotational Motion
Unit 6: Gravitation
Unit 7: Properties of Solids and Liquids
Unit 8: Thermodynamics
Unit 9: Kinetic Theory of Gases
Unit 10: Oscillations and Waves
Unit 11: Electrostatics
Unit 12: Current Electricity
Unit 13: Magnetic Effects of Current and Magnetism
Unit 14: Electromagnetic Induction and Alternating Currents
Unit 15: Electromagnetic Waves
Unit 16: Optics
Unit 17: Dual Nature of Matter and Radiation
Unit 18: Atoms and Nuclei
Unit 19: Electronic Devices
Unit 20: Communication Systems

PHY & MATHS IS ASKED MUCH MORE THAN CHEMISTRY IN UGEE

Section B: Maths

Unit 1: Sets, Relations, and Functions
Unit 2: Complex Numbers and Quadratic Equations
Unit 3: Matrices and Determinants
Unit 4: Permutations and Combinations
Unit 5: Mathematical Induction
Unit 6: Binomial Theorem
Unit 7: Sequence and Series
Unit 8: Limit, Continuity and Differentiability
Unit 9: Integral Calculus
Unit 10: Differential Equations
Unit 11: Coordinate Geometry
Unit 12: 3D Geometry
Unit 13: Vector Algebra
Unit 14: Statistics and Probability
Unit 15: Trigonometry
Unit 16: Mathematical Reasoning

Section C: Chemistry

Unit 1: Mole Concept
Unit 2: Atomic Structure
Unit 3: Thermodynamics
Unit 4: Electrochemistry
Unit 5: Chemical Kinetics
Unit 6: Chemical Equilibrium
Unit 7: States of Matter
Unit 8: Other (Physical Chemistry)
Unit 9: Biomolecules and Polymers
Unit 10: Named Reactions
Unit 11: POC (Practical Chemistry)
Unit 12: GOC (General Organic Chemistry)
Unit 13: Other (Organic Chemistry)
Unit 14: Chemical Bonding
Unit 15: Question Based on correct Order
Unit 16: Block Chemistry (Less Weightage)
Unit 17: Other (Inorganic Chemistry)

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PREVIOUS YEAR UGEE PAPER PATTERN

UGEE 2025 Paper Pattern

PAPER	No. of Que	Time	Marking	Total Marks	Negative Marking
UGEE 2025	90	3 hr		140	
SUPR	40	1 hr	+1	40	-0.25
REAP	50	2 hr	+2	100	-0.5

UGEE 2024 Paper Pattern

PAPER	No. of Que	Time	Marking	Total Marks	Negative Marking
UGEE 2024	90	3 hr		140	
SUPR	40	1 hr	+1	40	-0.25
REAP	50	2 hr	+2	100	-0.5

* In UGEE 2024, IIIT Hyderabad paper followed the same trend as of our book's syllabus, 9 Linguistics Questions came and our (IIITprep) students rocked. (Almost 90% of the paper came from IIITprep book topics, so cover it completely before the exam)

UGEE 2023 Paper Pattern

PAPER	No. of Que	Time	Marking	Total Marks	Negative Marking
UGEE 2023	100	3 hr		150	
SUPR	50	1 hr	+1	50	-0
REAP	50	2 hr	+2	100	-0.5

UGEE REAP Paper is generally divided into 5 phases

Section	Question	Description
REAP 1	33	Single correct type [5 options] (basically a Mixture of Case Study + Reasoning Aptitude)
REAP 2	4	Single correct type [5 options] (Graph/Diagram-based)
REAP 3	4	Single correct type [5 options] (Coding-Decoding/ Paragraph based)
REAP 4	2	Multiple answer correct type [5 options and no partial marking] (General Mental Ability)
REAP 5	7	Linguistics Text Answer type

* Give your Best, Cover the entire Syllabus and topics, and be ready to see any new type of questions apart from this book in Final Paper as IIIT Hyderabad will try to introduce any new type of question as always.

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PREVIOUS YEAR UGEE PAPER PATTERN

UGEE 2022 Paper Pattern

PAPER	No. of Que	Time	Marking	Total Marks	Negative Marking
UGEE 2022	100	3 hr		150	
SUPR	50	1 hr	+1	50	-0
REAP	50	2 hr	+2	100	-0.5

* In REAP out of total 50 questions, 43 were single correct questions & 7 were fill in blanks

UGEE 2021 Paper Pattern

PAPER	No. of Que	Time	Marking	Total Marks	Negative Marking
UGEE 2021	100	3 hr		150	
SUPR	50	1 hr	+1	50	-0
REAP	50	2 hr	+2	100	-0.5

* Each question was having 5 options

* In REAP out of total 50 questions, 43 were single correct questions & 7 were fill in blanks

UGEE 2020 Paper Pattern

PAPER	No. of Que	Time	Marking	Total Marks	Negative Marking
UGEE 2020	100	3 hr		150	
SUPR	50	1 hr	+1	50	-0
REAP	50	2 hr	+2	100	-0.5

* In REAP out of total 50 questions, 44 were single correct questions & 6 was fill in blanks

🙏 SMALL REQUEST FROM IIITPREP TEAM 🙏

FOR ALL THESE DATA, ENTIRE IIITPREP TEAM WORKS HARD FOR PROVIDING RELEVANT AND ACCURATE DATA TO STUDENT'S AND WE ALSO WON'T MIND SHARING IT FOR FREE BUT LAST YEAR ALL TEACHING INSTITUTES, YOUTUBERS HAS TAKEN DATA FROM US AND WITHOUT GIVING CREDITS THEY ARE TRYING TO GAIN VIEWS

HOPE YOU ALL UNDERSTAND OUR EFFORTS SO, IF YOU ARE CREATING YT VIDEO DO GIVE US ATLEAST ONE SHOUTOUT TO IIITPREP TEAM

VISIT : ***WWW.IIITPREP.COM***

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PREVIOUS YEAR UGEE PAPER PATTERN

WE HAVE GOT AROUND 400+ CONTRIBUTIONS FOR UGEE 2022 PAPER, WE WORK HARD TO VERIFY ALL DATA AND THEN TO COMPILE THOSE DATA FOR STUDENT'S

UGEE 2019 Paper Pattern

PAPER	No. of Que	Time	Marking	Total Marks	Negative Marking
UGEE 2019	90	3 hr		140	
SUPR	50	1 hr	+1	50	-0
REAP	40	2 hr	+2 for 30 Que +3 for 10 Que	90	0 for 30 Que -0.5 for 10 Que

UGEE 2018 Paper Pattern

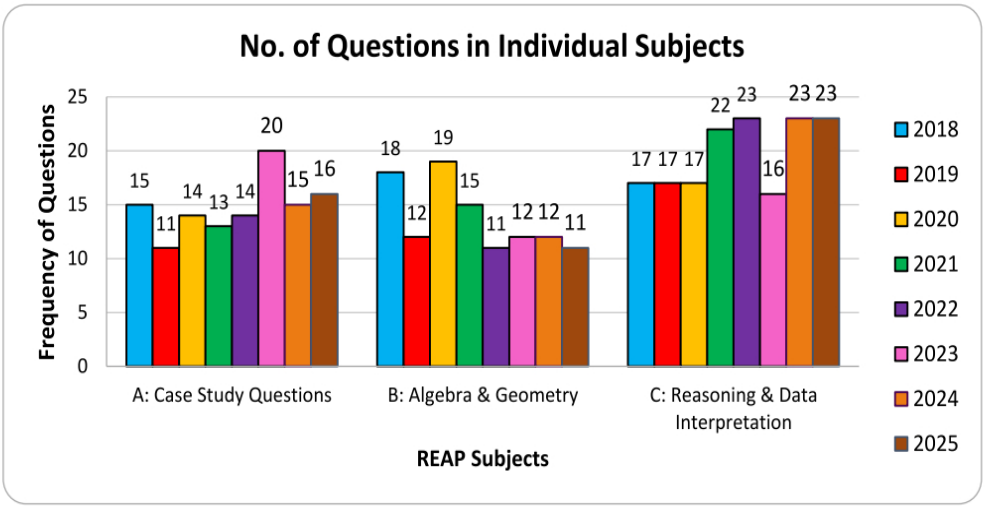
PAPER	No. of Que	Time	Marking	Total Marks	Negative Marking
UGEE 2018	100	3 hr		150	
SUPR	50	1 hr	+1	50	-0
REAP	50	2 hr	+2	100	-0.5

Note: Fill in the blanks questions means you have a text box and you have to type the final complete answer manually by keyboard (Mainly for **Linguistics Questions**)

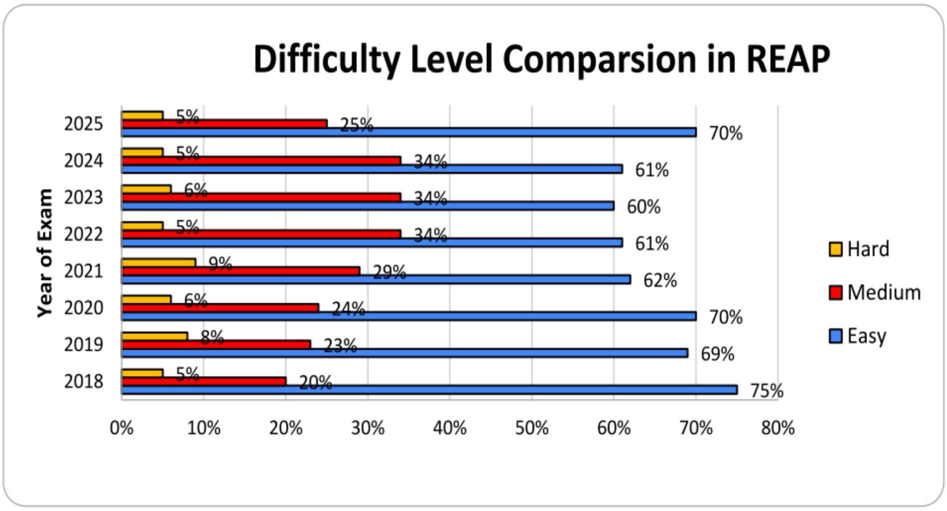
NOTE : IN UGEE 2021 & 2022 ON-SCREEN CALCULATOR WAS PROVIDED
UGEE IS OF 3 HR & CONSISTS OF TWO SECTIONS SUPR FOR 1 HR AND REAP FOR 2 HR
AFTER 1 HR YOU WILL BE AUTOMATICALLY SWITCHED TO REAP PAPER
SO, BEFORE FINAL UGEE EXAM DON'T FORGET TO GIVE
UGEE MOCK TEST ON OUR PORTAL BECAUSE IT'S PATTERN IS BIT DIFFERENT AND WE PROVIDE MOST RELEVANT UGEE MOCK ON SIMILAR PLATFORM & SYSTEM.

FOR MORE INFROMATION ABOUT SUPR AND REAP GUIDE
VISIT : *WWW.IIITPREP.COM*
WHATSAPP "REG ME" TO 7972348944

2.1
CHAPTER
REAP 2018/19/20/21/22/23/24/25 ANALYSIS


No. of Questions in Individual Subjects

	Year							
Total No. Of Que	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
A: Case Study Questions	15	11	14	13	14	20	15	16
B: Algebra & Geometry	18	12	19	15	11	12	12	11
C: Reasoning & Data Interpretation	17	17	17	22	23	16	23	23


Difficulty Level Comparsion in REAP

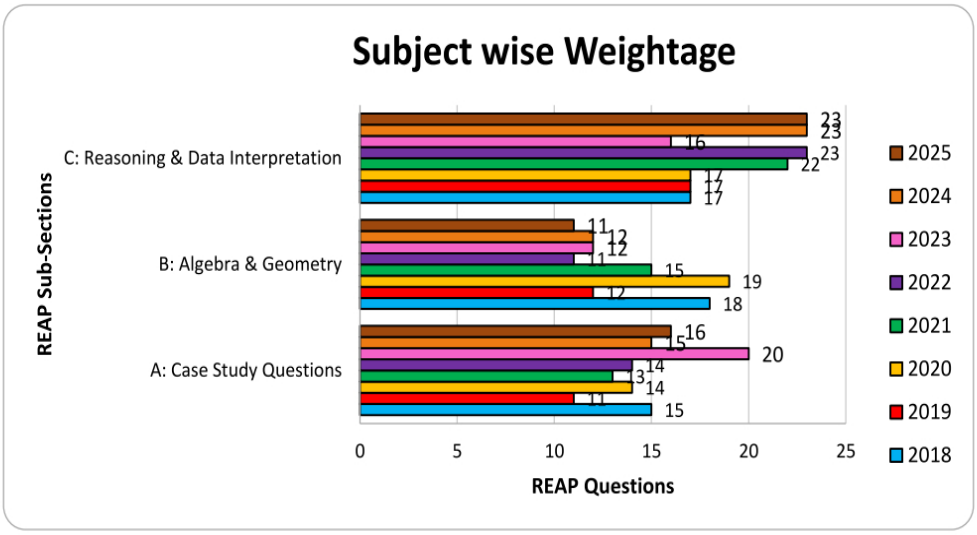
	Year							
Difficulty Level	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Easy	75%	69%	70%	62%	61%	60%	61%	70%
Medium	20%	23%	24%	29%	34%	34%	34%	25%
Hard	5%	8%	6%	9%	5%	6%	5%	5%

Note : In 2022 Paper, 6 Questions Came Directly from our IIITprep Book 😍, 12 Marks

Those who have solved our book 📖 seriously, were able to get 12 Marks for Free

2.1 CHAPTER

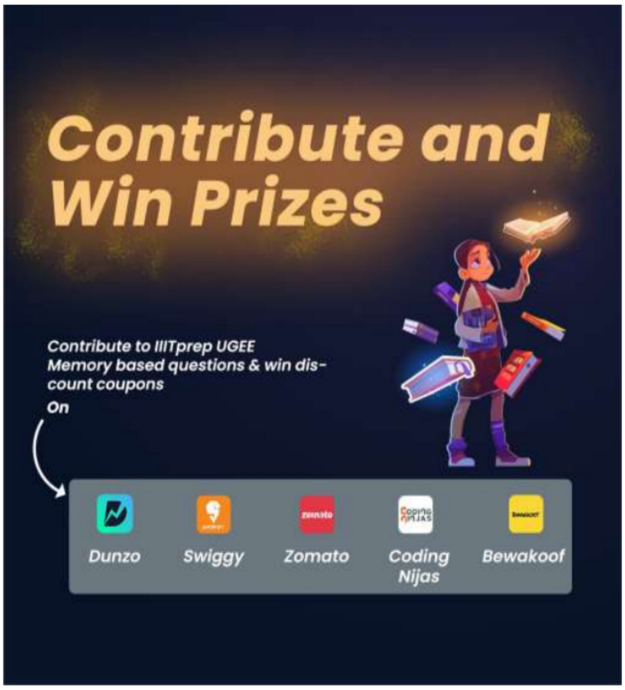
REAP SUBJECT WISE ANALYSIS



Weightage	Year							
	2018	2019	2020	2021	2022	2023	2024	2025
A: Case Study Questions	15	11	14	13	14	20	15	16
B: Algebra & Geometry	18	12	19	15	11	12	12	11
C: Reasoning & Data Interpretation	17	17	17	22	23	16	23	23

Note : In 2021 & 2022 Paper, there were 7 Questions from Linguistics for 14 Marks,
In 2024 9 Linguistics Que-> 18 Marks

It was Persian problem, mentioned in Linguistics section of our REAP book, lol 😂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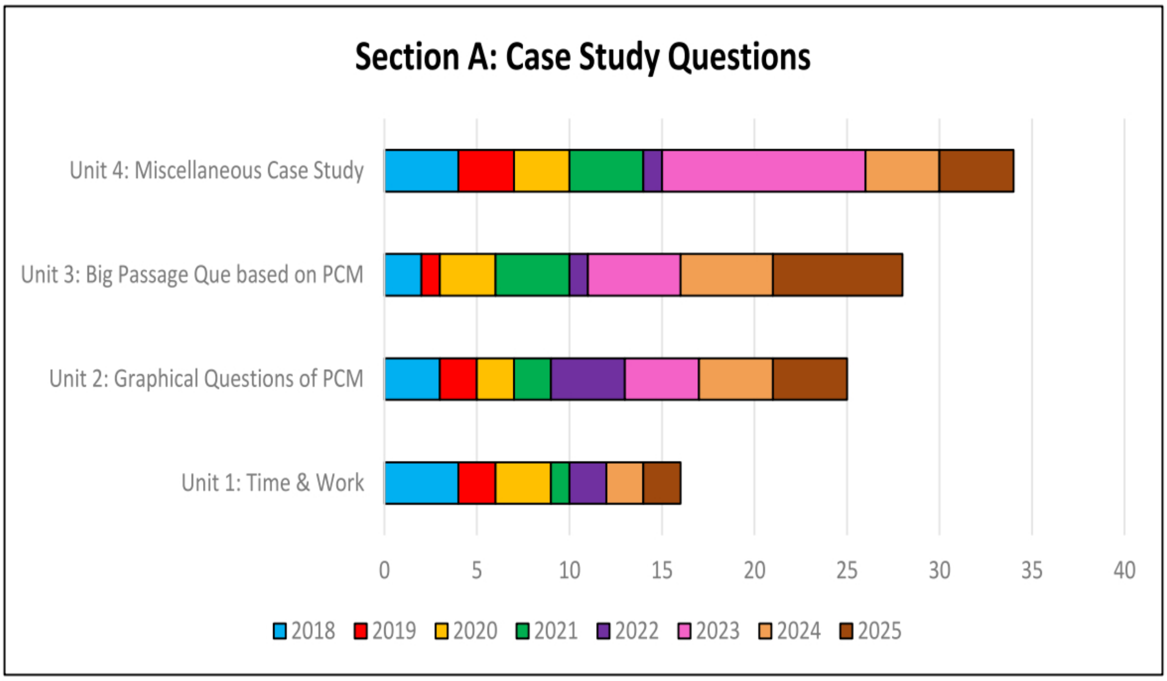
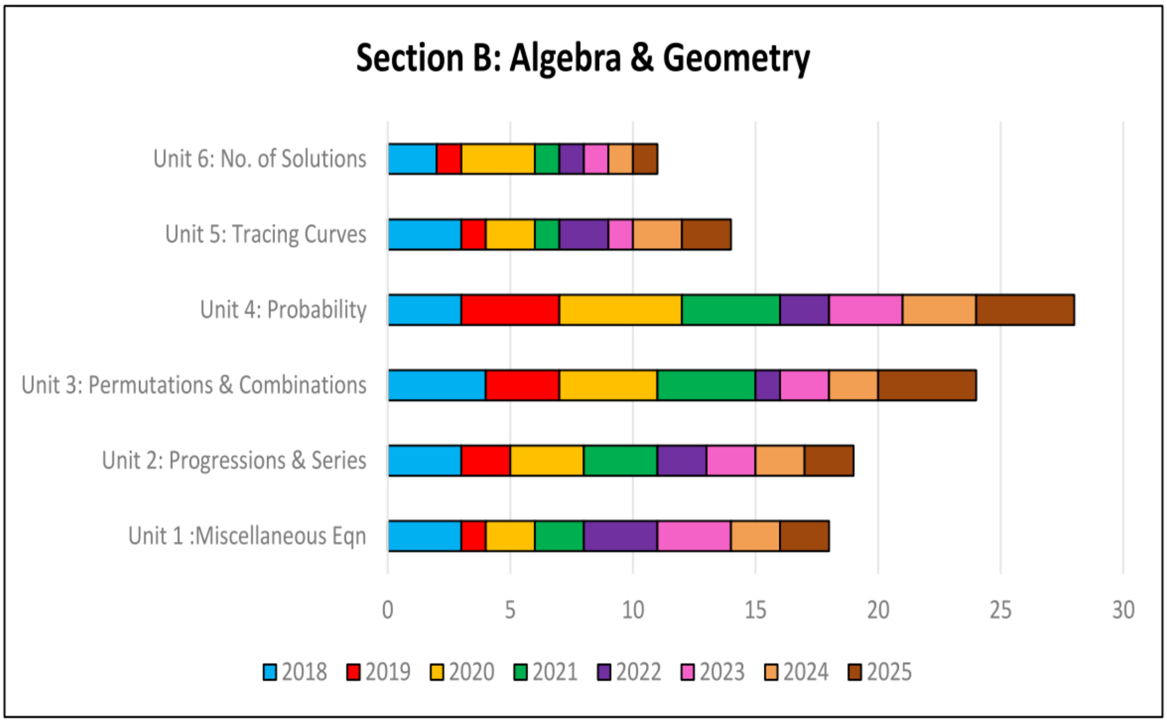
2.1 CHAPTER

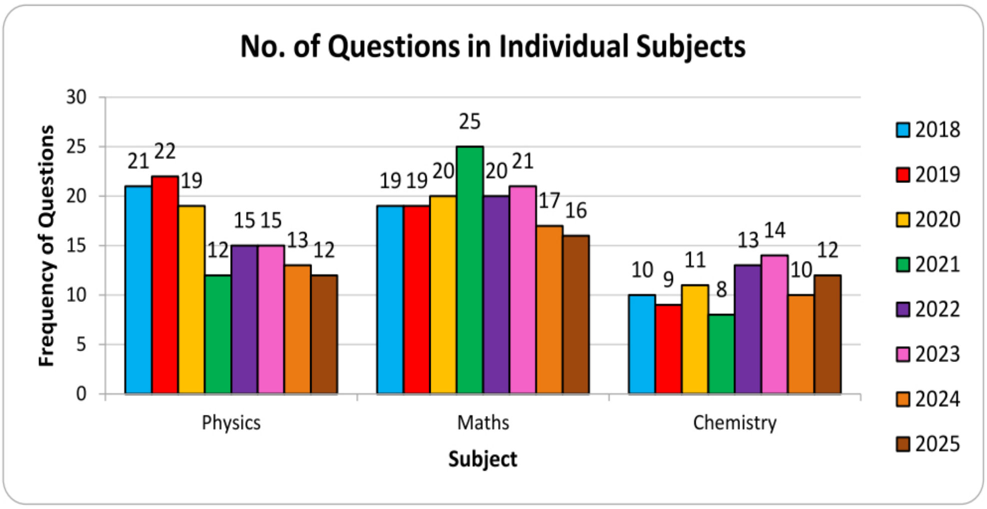
REAP TOPIC WISE ANALYSIS



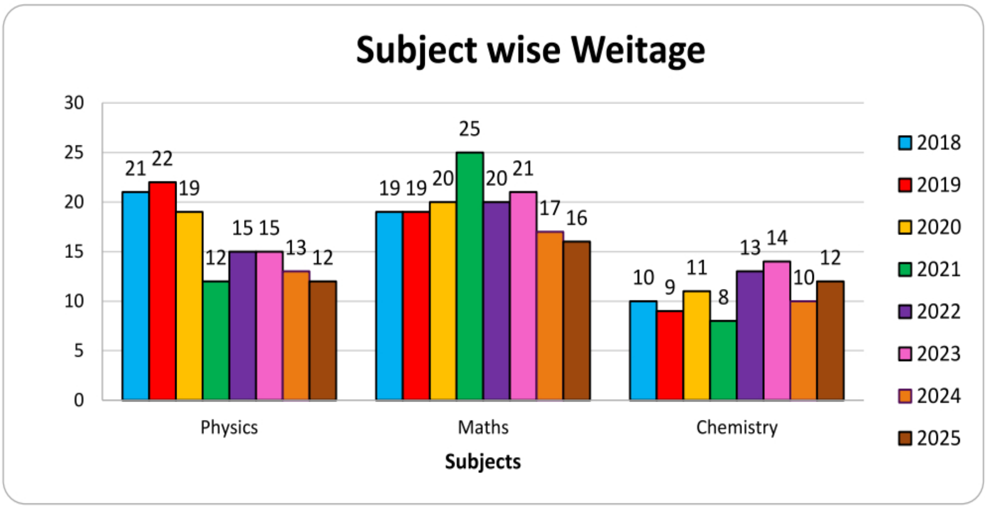


2.2 CHAPTER

SUPR 2018/19/20/21/22/23/24/25 ANALYSIS



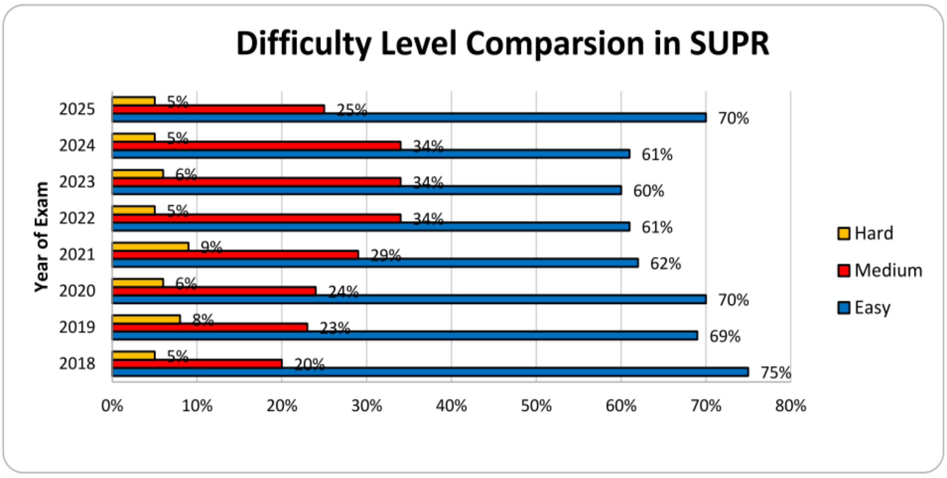
	Year							
Total No. Of Que	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Physics	21	22	19	12	15	15	13	12
Maths	19	19	20	25	20	21	17	16
Chemistry	10	9	11	8	13	14	10	12



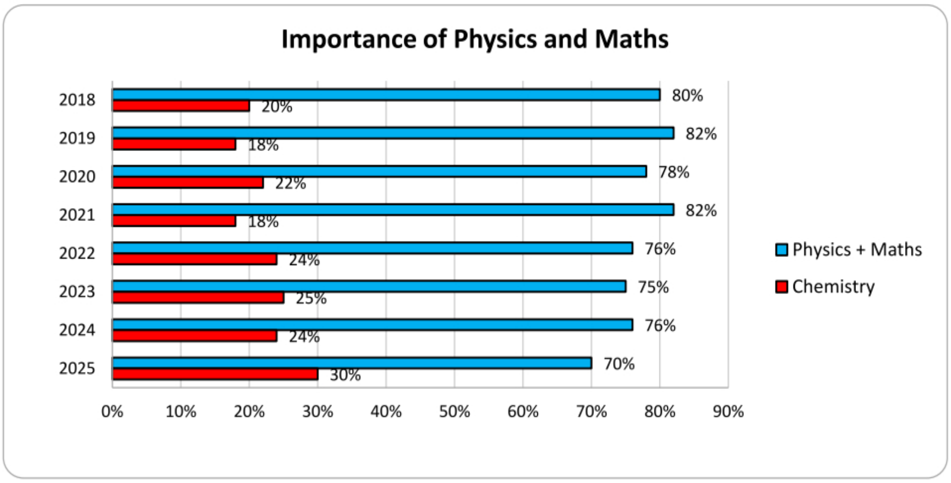
	Year							
Weightage	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Physics	21	22	19	12	15	15	13	12
Maths	19	19	20	25	20	21	17	16
Chemistry	10	9	11	8	13	14	10	12

E
CHAPTER

SUPR SUBJECT WISE ANALYSIS



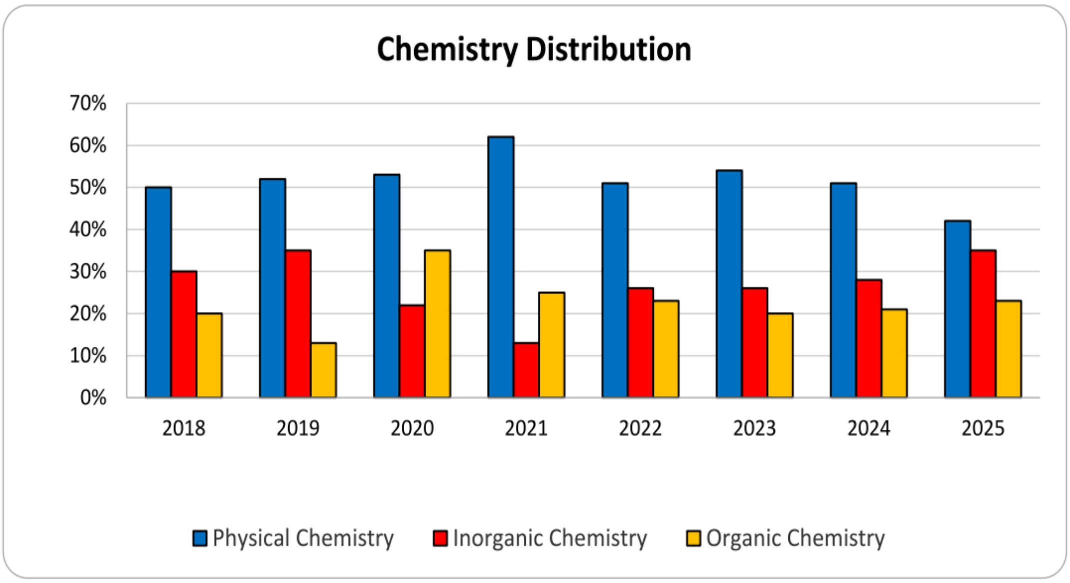
	Year							
Difficulty Level	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Easy	75%	69%	70%	62%	61%	60%	61%	70%
Medium	20%	23%	24%	29%	34%	34%	34%	25%
Hard	5%	8%	6%	9%	5%	6%	5%	5%
* Some questions were easy but lengthy at the same time in 2022, 2023, 2024 & 2025								



Year	Physics + Maths	Chemistry
2018	80%	20%
2019	82%	18%
2020	78%	22%
2021	82%	18%
2022	76%	24%
2023	75%	25%
2024	76%	24%
2025	70%	30%

E
CHAPTER

SUPR SUBJECT WISE ANALYSIS



Chemistry	2018	2019	2020	2021	2022	2023	2024	2025
Physical Chemistry	50%	52%	53%	62%	51%	54%	51%	42%
Inorganic Chemistry	30%	35%	22%	13%	26%	26%	28%	35%
Organic Chemistry	20%	13%	35%	25%	23%	20%	21%	23%

Note: In the 2022/ 23 Paper, As always Physical Chemistry was given more weightage but inorganic was also asked a bit, In 2025 Inroganic weitage was increased.

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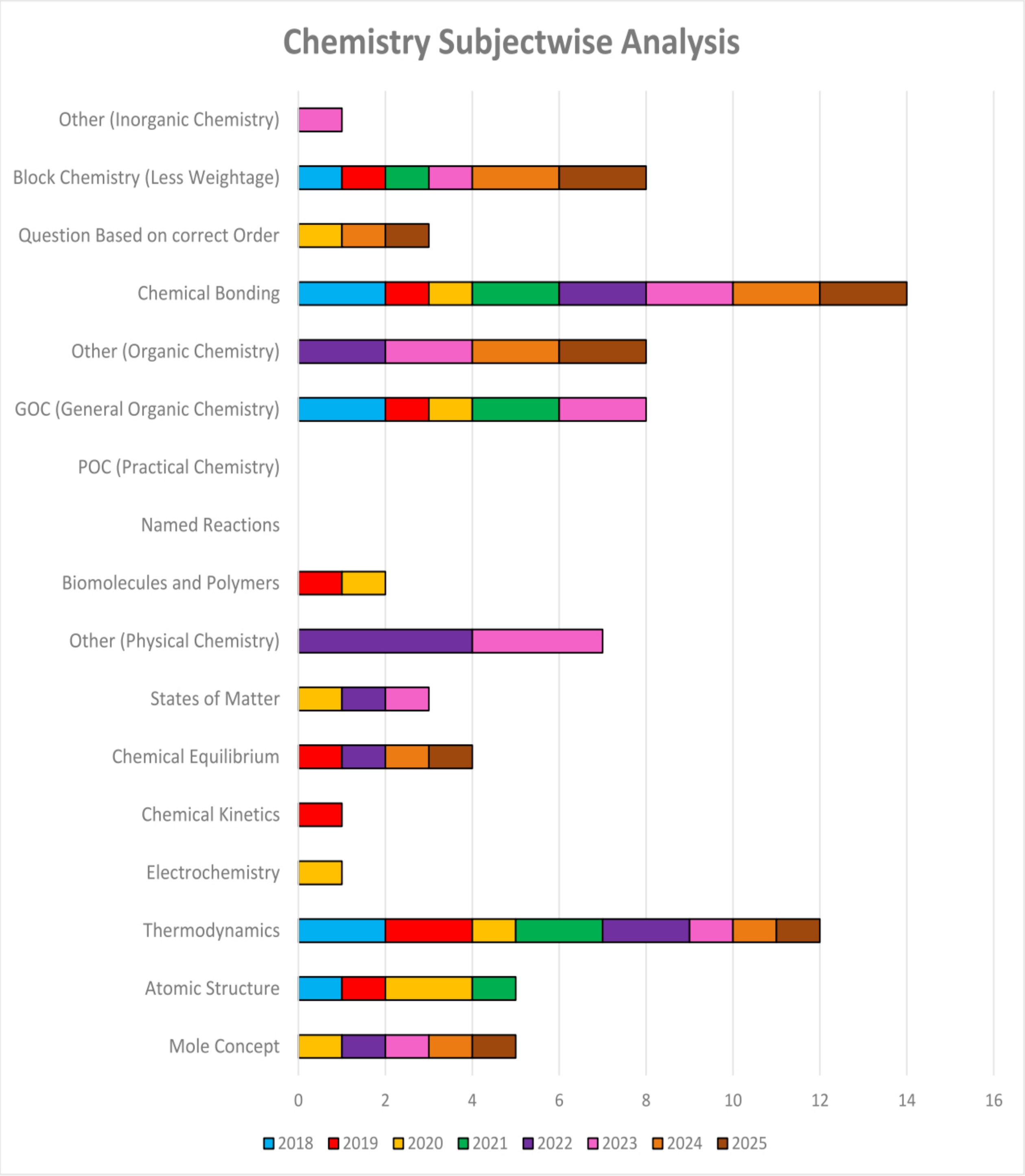

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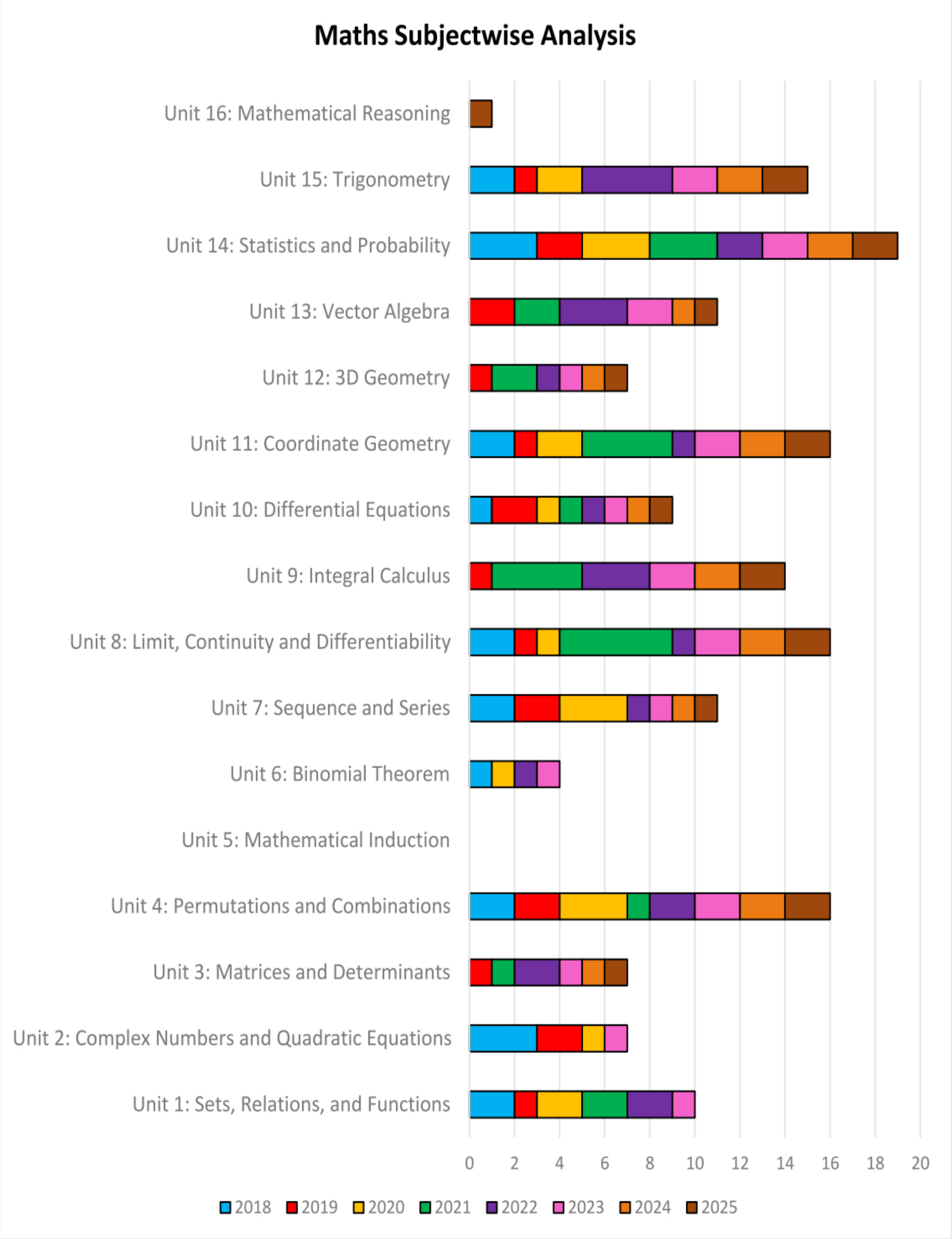
CHAPTER

SUPR CHAPTER WISE ANALYSIS



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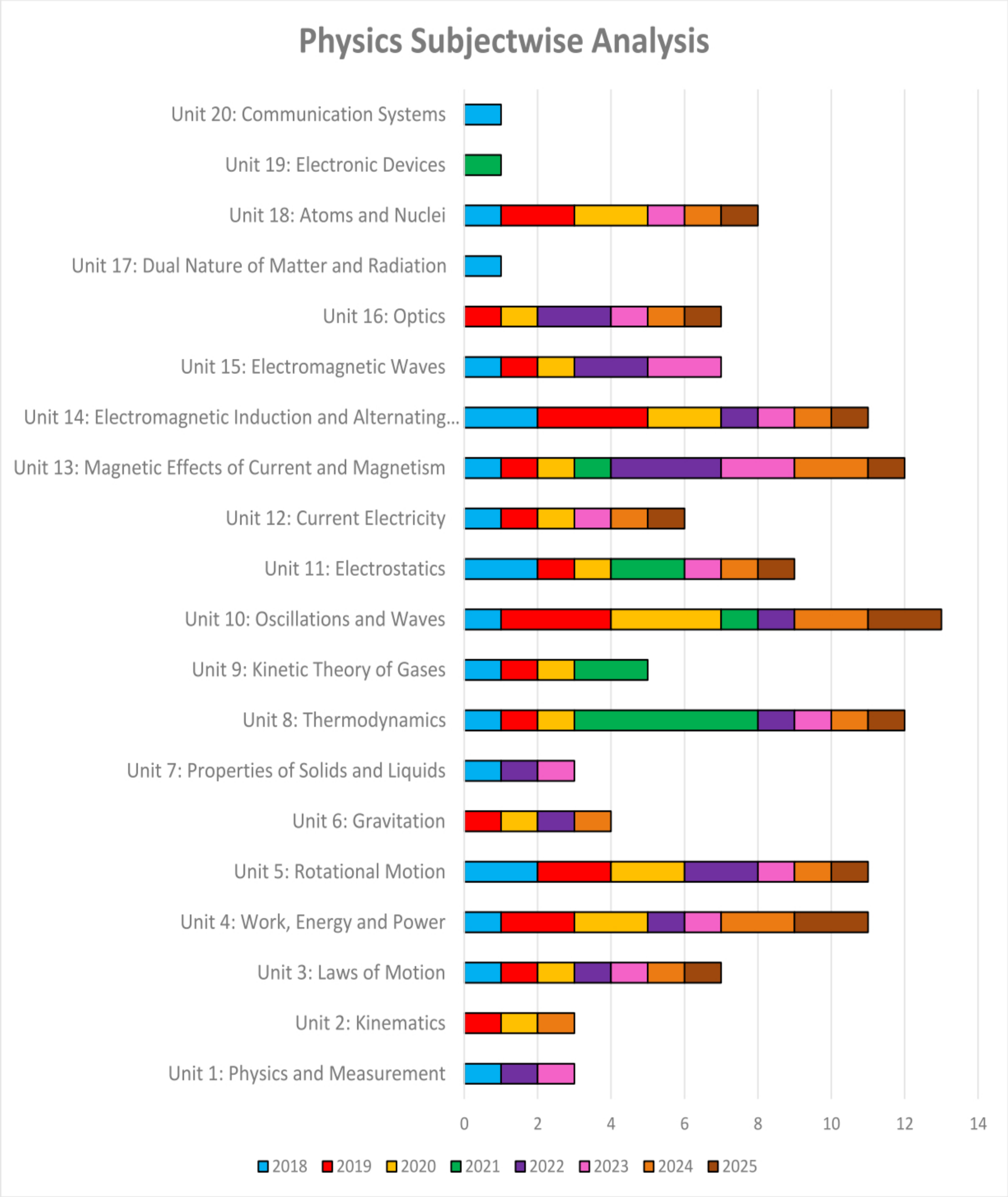
CHAPTER

SUPR CHAPTER WISE ANALYSIS



8. Say If He got x Sums right
   So, He gets 3x sums Wrong. So, $60 = x + 3x$.
   So, $x = 15$

9. A. True, Translational, Rotational, Vibrational are types of Motion.
   B. True, Rotational Degree = 3 as per KTG
   C. False, Translational Degree = 2 as per KTG
   D. True, Vibrational Degree = 3 as per KTG
   E. True, In Isolation, Conservation of Energy & Angular Momentum is valid.

10. First Understand How to Solve this type of Work Problem Revise **Time & Work Section** from SUPR & REAP Guide Book from IIITprep.com.
    Say Pipe A can do a piece of work in 1 hr
    Say Pipe B can do b piece of work in 1 hr
    Say Pipe C can do c piece of work in 1 hr
    So, $(a+b+c)6 = 1$ ---------- 1st Condition
    $(a+b+c)2 + (a+b)7 = 1$ ---------- $2(1/6) + (a+b)7 = 1$
    So, $a+b = 2/21$ ---------- Eqn 1
    So, $c = 1/6 – 2/21 = 1/14$
    Now C can do 1/14 piece of work Hence, 1 piece of work can be done by C in 14 days.

11. A. True, EMF will be induced by Motional EMF
    B. True, Conservation of Work & Energy. Coz, Work done by Magnetic Field is zero.
    C. False, always work done by Magnetic Field is Zero because, Direction of Force and Displacement are Perpendicular so, Dot Product is Zero always.
    D. True, $E = [\, V \times B.\ dl]$ where, V = Velocity and E = EMF
    E. True, $E = (V \times B).\ dl$ where B = Magnetic Field and E = EMF

12. Revise Main Topics from IIITprep SUPR BOOK @ IIITprep.com
    You must Know: Total Pressure $P_T = P_A + P_B$ Where P_A is Partial Pressure
    And $P_A = P^0_A X_A$ where P^0_A = Vapor Pressure and X_A = Mole Fraction of A
    Similarly, for $P_B = P^0_B X_B$
    We Know $X_A + X_B = 1$ ------------ Sum of Mole Fractions
    Given: $P_T = 3\, P_A = P_A + P_B$
    $= 3\, P^0_A X_A$ --------- 3
    So, $2P_A = P_B$
    $2P^0_A X_A = P^0_B X_B$ --------- 1
    $X_A + X_B = 1$ --------- 2
    From 1 & 2 we get $XA = P^0_B / (2P^0_A + P^0_B)$ Put X_A in 3 We Get Ans as
    $P_T = 3P^0_A P^0_B / (2P^0_A + P^0_B)$

13. Revise Main Topics from IIITprep SUPR BOOK @ IIITprep.com
    $P_{SA} = P^0_A X_A$ General Formula to Be Remembered. Direct Que From NCERT.
    Acc. To rault's law
    Po-PS whole divided by Po is equal to the mole fraction of solute which is Xs
    Xs + Xo=1

14. Direct from NCERT But Approximate Value can be Calculated
    By, $V_{rms} = \sqrt{(3RT/M)}$ Formula
    Nitrogen molecule contains 28 nucleons and nitrogen atom contains 14 nucleons.

15. Method (1)

$KE\ \alpha\ mv^2$ Velocity $\alpha\ \sqrt{(T/M)}$ as $V_{rms} = \sqrt{(3RT/M)}$

$KE\ \alpha\ MT/M$ $Velocity^2\ \alpha\ (T/M)$

$KE\ \alpha$ Temp

So, as Temp is Constant, KE will Remain Constant so, it is Independent of Masses.

Method (2)

As the average Kinetic energy of a particle in an ideal gas equation is: -

KE=3/2kT, where k is Boltzmann's constant and T is temperature

By this formula we can see that at a constant temperature, average kinetic energy remains constant and is independent of mass.

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3.2 CHAPTER

OFFICIAL REAP SAMPLE PAPER

1. Two chairs (A and B) are in an empty room overnight. Chair A is made of steel while chair B is made of wood. In the night and in the morning, the temperature of the room is 290 K. In the morning, a person chooses between Chair A and Chair B as the seat by feeling (touching) the chair and choosing one which feels warmer. Person chooses __ (BLANK-1) __ as it feels warmer because __ (BLANK-2) ___ has __(BLANK-3) ___ ___ (BLANK-4) ____ than ___(BLANK-5) ___.

(A) BLANK-1: Chair A, Chair B, neither chair

(B) BLANK-2: metal, wood, air, human body

(C) BLANK-3: higher, lower, different, same

(D) BLANK-4: heat capacity, heat conductivity, electrical resistance

(E) BLANK-5: metal, wood, air, human body

2. Consider a rope fixed at both ends under tension so that it is horizontal (i.e., assume the rope is along x-axis, with gravity acting along z-axis). Now the right end is continually oscillated at high frequency n (say n=100 Hz) horizontally and in a direction along the rope; amplitude of oscillation is negligible. The oscillation travels along the rope and is reflected at the left end.

Let the total length of rope be l, total mass be m and the acceleration due to gravity be g.

After initial phase (say a minute or so), the rope has __(BLANK-1) __ wave, which is __(BLANK-2) __ in nature. It results from superposition of left travelling and right travelling __(BLANK-3) __ waves. This resulting wave has a frequency __ (BLANK-4) _ that of oscillation frequency nu. Simple dimensional analysis indicates that the frequency of can be of the form: ___(BLANK-5) __.

(A) BLANK-1: travelling, oscillating, stationary, regular

(B) BLANK-2: transverse, longitudinal, regular, irregular

(C) BLANK-3: transverse, longitudinal, regular, irregular

(D) BLANK-4: equal to, half, double, independent from

(E) BLANK-5: sqrt (g / l), sqrt (m g), sqrt (m g l), sqrt (l / g)

3. When I was a child, there used to be a fair in my town during the Diwali and Id festivities. Among the many things I saw was a strange puppet show. There were three puppets, one of a man, another of a woman and the third one of a rakshasa (demon). Whenever the rakshasa was brought close to the woman, she would turn her face away. But when the man was brought close to her, she would turn back and face the man.

I and my friends looked at this show and argued for hours what caused the woman to turn her face. Choose one or more of the options below about my childhood experience above:

(A) The strange behaviour of the woman puppet was:

Which word means *cowboy* and which word means *calf*? You have already observed that a plural noun can be made by adding an extra letter (*ceoj/cecoj*, man/men). You also know that the plural noun *cowboys* occurs in *Pi 'o ceposid g wapkial g wisilo*. This might lead you to match up *wapkial* with *wakial* (Spanish *vaquero*) meaning *cowboys/cowboy*. *Wisilo/wipsilo* would then mean *calf*.

Ha-cecposid 'o g wakial g wipsilo.	The cowboy is branding the calves.
Ceposid 'o g wakial g wisilo.	The cowboy is branding the calf.
Pi 'o ceposid g wapkial g wisilo.	The cowboys are not branding the calf.

The tricky part is that *ha-cecposid* (branding with reduplication of the initial *c*) doesn't go with the plural subject (cowboys), but with the plural object (calves).

B2.

		Correct	Mistake
1.	Ha-cecposid 'o g wakial g wisilo. Brand-plural cowboy calf		X
2.	Cickpan 'añ 'a:ñi. Work-plural I		X
3.	Cickpan 'ac 'a:cim Work-plural we.	X	

The first sentence must be wrong because the verb contains the reduplicative *c*, but both nouns are singular. The second sentence is wrong because *'a:ñi* means *I* and is singular, but the verb contains the reduplicative *c*. The third sentence is correct.

11. First **Revise the Linguistics Concept from IIITprep Book (REAP UGEE Part II)** from iiitprep.com
Appropriate Method 1: Alphabet Pattern (Encoding Decoding Question) From IIITprep REAP Book

Method 2: Exam Approach (Eliminating Options)
In C Part: P Stands for O or I but given that I Stands for D. It Contradicts so, p must stand for O only. --- [1]
In B Part: As it is given that H stands for A means from Option a [_] [_] is most proper So, only 1 Option Starting from a I.e., option 4. Tell us that V stands for R -- [2]
In A part: We Know R -> O
V -> R
C -> N & G->?
[_] ORN is Ans Matches with 2nd Option Only.
Means G must stand for B --[3]
Now for C Part: We have few words given in Encrypted Sentenced I.e.,
H -> A J -> E C -> N L -> S I -> D P -> O V -> R G -> B
GPVC -> BORN
BHI -> _AD
LPBJ -> SO_E
Form option in C We have B -> M or L
But for Meaningful Word, B must stand for M Not L so, B -> M

Method 3: Exam Approach (Eliminating Options)

-> In the B part of the question only one option that is (d) are satisfies because h stands for a and in B part there is only one such option that is (d) are.
So, V -> R
J -> E
->In the C part looking at options we get that P must stand for either O or I. If P stands with I then In A part you will not be able to find answer as from the options of part A, P stands for either O or U, taking common from part A and C we get P->O
->In the A part we have to find for GPVC
Given C stands for N
Found V stands for R and P stands for O
So, we found the answer for part A that is GPVC->born (option b)
Here we found that G stands for b
Upto here we have solved for Part A and part B
Now for part C, LPBJ -> so_e
We have to fill that space between o and e.
Now to make the given decrypted sentence a sensible meaning we arrive at the result that B -> M.
So, answer of C part will be option A.

12. First Revise **How to Solve Linguistic Question from IIITprep REAP Guide** available on iiitprep.com
First Understand its Language by Observation.

October is Repeated 3 times Similarly, the only word Repeated 3 Times is
5th is Repeated 3 times. ---------- [1]
Now Tuesday April is Repeated with Aprili Jumanne in 3 ,5 Sentence -------[2]
Now we have date 3 with December only, means in 1 only --------[3]
Now as with Aprili you have pili, nne for 2/4th ------[4]
Now with October in (2, 4, 6) doesn't matches with December means No Common in between October & December means, on left side it must be matched with F Sat. December coz, Sun is Common in Dec & Oct so it will Contradicts --------[5]

Now Here is Logic Observed in between date and Day.

1. Jumanne -> Tuesday coz last word nne means 4th -2 = 2 ------i.e., 2nd day of week
2. Jumantatu-> Monday coz, tatu means 3rd -2 = 1 ------I. e 1st day of week
3. Jumatano ->? so, tano means 5th -2 = 3 ------i.e., 3rd day of week -----[6]

Now the puzzle Solved. Means

1. October -> Octoba && 5th -> tano ------------from [1]
2. April -> Aprili && Tuesday -> Jumanne ------------from [2]
3. December -> Disemba && 3rd -> tatu -------------from [3]
4. 2nd -> pili ---------from [4] coz. Pili Matches with 8 option given below In Upper Question
5. Saturday -> Jumamosi --------from [5]
6. 4th -> nne -----------------from [4]
7. Monday -> Jumatatu ---------------from Remaining data of October.
   So Now Get Answer

UGEE 2018 MEMORY BASED PAPER

IIITPREP PUBLICATION

UGEE 2018 Paper Pattern

PAPER	No. of Que	Time	Marking	Total Marks	Negative Marking
UGEE 2018	100	3 hr		150	
SUPR	50	1 hr	+1	50	0
REAP	50	2 hr	+2	100	-0.5

TIME : 3 HRS *TOTAL MARKS : 150*

SUPR (SUBJECT PROFICIENCY TEST)

Physics

1. A metal surface is illuminated by light of given intensity and frequency to cause photoemission. If the intensity of illumination is reduced to one fourth of its original value then the maximum KE of the emitted photoelectrons would be
(a) twice the original value
(b) four times the original value
(c) one fourth of the original value
(d) unchanged

2. Torque acting on a rectangular coil carrying current 'I' situated parallel to magnetic field of induction 'B', having number of turns 'n' and area 'A' is
(a) $ni(\hat{A}\cdot\hat{B})$ (b) $\frac{nBA}{i}$ (c) $ni(\mathbf{A}\times\mathbf{B})$ (d) $\frac{iBA}{n}$

3. A force $(\mathbf{F}) = -5\hat{i} - 7\hat{j} + 3\hat{k}$ acting on a particle causes a displacement $(s) = 3\hat{i} - 2\hat{j} + a\hat{k}$ in its own direction. If the work done is 14 J, then the value of 'a' is
(a) 0 (b) 5 (c) 15 (d) 1

4. When the electron in hydrogen atom jumps from fourth Bohr orbit to second Bohr orbit, one gets the
(a) second line of Balmer series
(b) first line of Balmer series
(c) first line of Pfund series
(d) second line of Paschen series

5. Light of wavelength 'λ' is incident on a single slit of width 'a' and the distance between slit and screen is 'D'. In diffraction pattern, if slit width is equal to the width of the central maximum then 'D' is equal to
(a) $\frac{a}{2\lambda}$ (b) $\frac{a^2}{2\lambda}$ (c) $\frac{a}{\lambda}$ (d) $\frac{a^2}{\lambda}$

6. In U.C.M., when time interval $\delta t \to 0$, the angle between change in velocity $(\delta\mathbf{v})$ and linear velocity $(\mathbf{v})$ will be
(a) 0° (b) 90° (c) 180° (d) 45°

7. A stretched string fixed at both ends has 'm' nodes, then the length of the string will be
(a) $(m-1)\frac{\lambda}{2}$ (b) $\frac{(m+1)\lambda}{2}$
(c) $\frac{m\lambda}{2}$ (d) $(m-2)\frac{\lambda}{2}$

8. A particle is performing a linear simple harmonic motion of amplitude 'A'. When it is midway between its mean and extreme position, the magnitudes of its velocity and acceleration are equal. What is the periodic time of the motion?
(a) $\frac{2\pi}{\sqrt{3}}$ s (b) $\frac{\sqrt{3}}{2\pi}$ s
(c) $2\pi\sqrt{3}$ s (d) $\frac{1}{2\pi\sqrt{3}}$ s

REAP SECTION

1. 25 persons are in a room. 15 of them play hockey, 17 of them play football and 10 of them play both hockey and football. Then the number of persons playing neither hockey nor football is

(a) 2
(b) 17
(c) 13
(d) 3

2. If 137 + 276 = 435 how much is 731 + 672?

(a) 534
(b) 1403
(c) 1623
(d) 1531

3. 5 skilled workers can build a wall in 20 days; 8 semiskilled workers can build a wall in 25 days; 10 unskilled workers can build a wall in 30 days. If a team has 2 skilled, 6 semiskilled and 5 unskilled ~~workers, how long will it take to build the wall?~~

(a) 20 days
(b) 18 days
(c) 16 days
(d) 15 days

4. Given digits 2, 2, 3, 3, 3, 4, 4, 4, 4 how many distinct 4 digit numbers greater than 3000 can be formed?

(a) 50
(b) 51
(c) 52
(d) 54

5. Hari (H), Gita (G), Irfan (I) and Saira (S) are siblings (i.e. brothers and sisters). All were born on 1st January. The age difference between any two successive siblings (that is born one after another) is less than 3 years. Given the following facts:

   1. Hari's age + Gita's age > Irfan's age + Saira's age.
   2. The age difference between Gita and Saira is 1 year. However, Gita is not the oldest and Saira is not the youngest.
   3. There are no twins.

In what order were they born (oldest first)?

(a) HSIG
(b) SGHI
(c) IGSH
(d) IHSG

6. If Log(P) = (1/2)Log(Q) = (1/3)Log(R), then which of the following options is TRUE?

(a) $P^2 = Q^3R^2$
(b) $Q^2 = PR$
(c) $Q^2 = R^3P$
(d) $R = P^2Q^2$

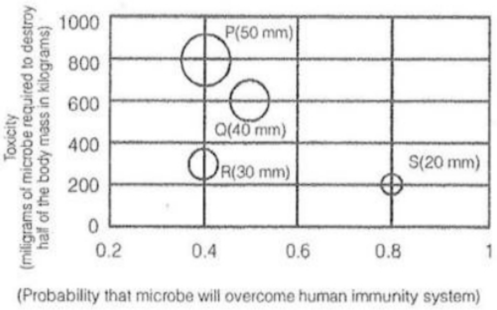
7. A container originally contains 10 litres of pure spirit. From this container 1 litre of spirit is replaced with 1 litre of water. Subsequently, 1 litre of the mixture is again replaced with 1 litre of water and this processes is repeated one more time. How much spirit is now left in the container?

(a) 7.58 litres
(b) 7.84 litres
(c) 7 litres
(d) 7.29 litres

8. The variable cost (V) of manufacturing a product varies according to the equation V = 4q, where q is the quantity produced. The fixed cost (F) of production of same product reduces with q according to the equation F = 100/q. How many units should be produced to minimize the total cost (V + F)?

(a) 5
(b) 4
(c) 7
(d) 6

9. P, Q, R and S are four types of dangerous microbes recently found in a human habitat. The area of each circle with its diameter printed in brackets represents the growth of a single microbe surviving human immunity system within 24 hours of entering the body. The danger to human beings varies proportionately with the toxicity, potency and growth attributed to a microbe shown in the figure below:



A pharmaceutical company is contemplating the development of a vaccine against the most dangerous microbe. Which microbe should the company target in its first attempt?

(a) P (b) Q

(c) R (d) S

10. A transporter receives the same number of orders each day. Currently, he has some pending orders (backlog) to be shipped. If he uses 7 trucks, then at the end of the 4th day he can clear all the orders. Alternatively, if he uses only 3 trucks, then all the orders are cleared at the end of the 10th day. What is the minimum number of trucks required so that there will be no pending order at the end of the 5th day?

(a) 4 (b) 5

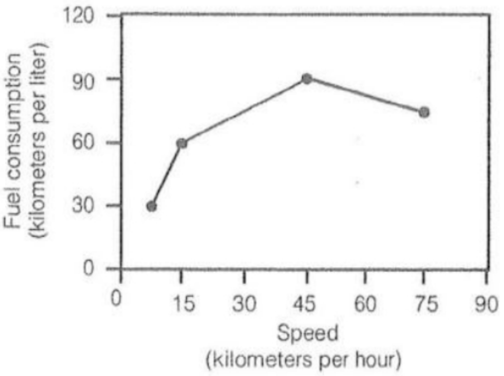
(c) 6 (d) 7

11. There are two candidates P and Q in an election. During the campaign 40% of the voters promised to vote for P, and rest for Q. However, on the day of election 15% of the voters went back on their promise to vote for P and instead voted for Q . 25% of the voters went back on their promise to vote for Q and instead voted for P. Suppose, P lost by 2 votes, then what was the total number of voters?

(a) 100 (b) 110

(c) 90 (d) 95

12. The fuel consumed by a motorcycle during a journey while travelling at various speeds is indicated in the graph below



The distance covered during four laps of the journey are listed in the table below:

Lap	Distance (kilometers)	Average speed (kilometers per hour)
P	15	15
Q	75	45
R	40	75
S	10	10

From the given data, we can conclude that the fuel consumed per kilometre was least during the lap

(a) P (b) Q

(c) R (d) S

13. Three friends, R, S and T shared toffee from a bowl. R took 1/3rd of the toffees, but returned four to the bowl. S took 1/4th of what was left but returned three toffees to the bowl. T took half of the remainder but returned two back into the bowl. If the bowl had 17 toffees left, how many toffees were originally there in the bowl?

(a) 38 (b) 31

(c) 48 (d) 41

14. Given that $f(y) = |y|/y$, and q is any non-zero real number, the value of $|f(q) - f(-q)|$ is

(a) 0 (b) –1

(c) 1 (d) 2

15. The sum of n terms of the series 4 + 44 + 444 + ... is

(a) $(4/81)[10^{n+1} - 9n - 1]$

(b) $(4/81)[10^{n-1} - 9n - 1]$

(c) (4/81) $[10^{n+1} - 9n - 10]$
(d) (4/81) $[10^{n} - 9n - 10]$

16. The cost function for a product in a firm is given by $5q^2$, where q is the amount of production. The firm can sell the product at a market price of ₹ 50 per unit. The number of units to be produced by the firm such that the profit is maximized is
(a) 5 (b) 10
(c) 15 (d) 25

17. A political party orders an arch for the entrance to the ground in which the annual conventions is being held. The profile of the arch follows the equation $y = 2x - 0.1\,x^2$ where y is the height of the arch in meters. The maximum possible height of the arch is
(a) 8 meters (b) 10 meters
(c) 12 meters (d) 14 meters

18. An automobile plant contracted to buy shock absorbers from two supplies X and Y. X supplies 60% and Y supplies 40% of the shock absorbers. All shock absorbers are subjected to a quality test. The ones that pass the quality test are considered reliable. Of X's shock absorbers, 96% are reliable. OF Y's shock absorbers, 72% are reliable.

The probability that a randomly chosen shock absorber, which is found to be reliable, is made by Y is
(a) 0.288 (b) 0.334
(c) 0.667 (d) 0.720

19. Which of the following assertions are CORRECT?
P: Adding 7 to each entry in a list adds 7 to the mean of the list
Q: Adding 7 to each entry in a list adds 7 to the standard deviation of the list
R: Doubling each entry n a list doubles the mean of the list
S: Doubling each entry in a list leaves the standard deviation of the list unchanged
(a) P, Q (b) Q, R
(c) P, R (d) R, S

20. Given the sequence of terms, AD CG FK JP, the next time is
(a) OV (b) OW
(c) PV (d) PW

21. If $(1.001)^{1259} = 3.52$ $(1.001)^{2062} = 7.85$, then $(1.001)^{3321}$
(a) 2.23 (b) 4.33
(c) 11.37 (d) 27.64

22. Raju has 14 currency notes in his pocket consisting of only ₹ 20 notes and ₹ 10 notes. The total money value of the notes is ₹ 230. The number of ₹ 10 notes that Raju has is
(a) 5 (b) 6
(c) 9 (d) 10

23. A and B friends. They decide to meet between 1 PM and 2 PM on a given day. There is a condition that whoever arrives first will not wait for the other for more than 15 minutes. The probability that they will meet on that day is
(a) 1/4 (b) 1/16
(c) 7/16 (d) 9/16

24. The data given in the following table summarizes the monthly budget of an average household.

Category	Amount
Food	4000
Clothing	1200
Rent	2000
Savings	1500
Others	1800

The approximate percentage of the monthly budget NOT spent on savings is
(a) 10% (b) 14%
(c) 81% (d) 86%

25. There are eight bags of rice looking alike, seven of which have equal and one is slightly heavier. The weighing balance is of unlimited capacity. Using this balance the minimum number of weighting required to identify the heavier bag is
(a) 2 (b) 3
(c) 4 (d) 8

UGEE 2019 MEMORY BASED PAPER

IIITPREP PUBLICATION

UGEE 2019 Paper Pattern

PAPER	No. of Que	Time	Marking	Total Marks	Negative Marking
UGEE 2019	90	3 hr		140	
SUPR	50	1 hr	+1	50	0
REAP	40	2 hr	+2 for 30 Que +3 for 10 Que	90	0 for 30 Que -0.5 for 10 Que

TIME : 3 HRS *TOTAL MARKS : 140*

SUPR (SUBJECT PROFICIENCY TEST)

Physics

1. In amplitude modulation, the amplitude of carrier wave is A_c and that of the modulating signal is A_m. In practice, the ratio of A_m to A_c is kept less than or equal to one, to avoid

(a) distortion (b) attenuation
(c) fading (d) noise

2. A pipe open at both ends and a pipe closed at one end have same length. The ratio of frequencies of their P^{th} overtone is

(a) $\frac{p+1}{2p}$ (b) $\frac{p+1}{2p+1}$ (c) $\frac{2(p+1)}{2p+1}$ (d) $\frac{p}{2p+1}$

3. Glass has refractive index μ with respect to air and the critical angle for a ray of light going from glass to air is θ. If a ray of light is incident from air on the glass with angle of incidence θ, corresponding angle of refraction is

(a) $\sin^{-1}(\mu)$ (b) $\sin^{-1}\left(\frac{1}{\mu^2}\right)$
(c) $\sin^{-1}\left(\frac{1}{\sqrt{\mu}}\right)$ (d) $\sin^{-1}\left(\frac{1}{\mu}\right)$

4. Maximum kinetic energy gained by the charged particle in the cyclotron is independent of

(a) radius of the dees (b) charge
(c) mass (d) frequency of revolution

5. A molecule of water on the surface experiences a net

(a) downward resultant unbalanced adhesive force
(b) upward resultant unbalanced cohesive force
(c) downward resultant unbalanced cohesive force
(d) upward resultant unbalanced adhesive force

6. The magnifying power of a telescope is nine. When it is adjusted for parallel rays, the distance between the objective and eyepiece is 20 cm. The focal length of objective and eyepiece are respectively

(a) 10 cm, 10 cm (b) 18 cm, 2 cm
(c) 15 cm, 5 cm (d) 11 cm, 9 cm

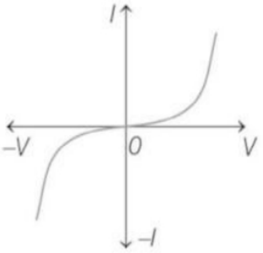
7. The SI unit and dimensions of Stefan's constant σ in case of Stefan's law of radiation is

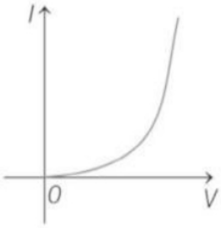
(a) $\frac{J}{m^3 s^4}, [M^1L^0T^{-3}K^{-4}]$ (b) $\frac{J}{m^2 s^4 K}, [M^1L^0T^{-3}K^3]$
(c) $\frac{J}{m^3 s\ K^4}, [M^1L^0T^{-3}K^4]$ (d) $\frac{J}{m^2 s\ K^4}, [M^1L^0T^{-3}K^{-4}]$

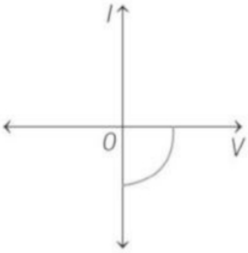
8. In a hydrogen atom, an electron of charge e revolves in a orbit of radius r with speed v. Then, magnetic moment associated with electron is

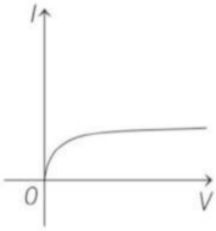
(a) $\frac{evr}{2}$ (b) $2evr$ (c) evr (d) $\frac{evr}{3}$

9. *V-I* characterstics of LED is shown correctly by graph

(a)


(b)


(c)


(d)


10. The stopping potential of the photoelectrons, from a photo cell is
(a) directly proportional to intensity of incident light
(b) directly proportional to frequency of incident light
(c) inversely proportional to frequency of incident light
(d) Inversely proportional to intensity of incident light

11. The refractive index of the material of crystal is 1.68 and that of castor oil is 1.2. When a ray of light passes from oil to glass, its velocity will change by a factor

(a) $\frac{2}{3}$ (b) $\frac{3}{4}$ (c) $\frac{5}{6}$ (d) $\frac{5}{7}$

12. Consider a particle of mass *m* suspended by a string at the equator. Let *R* and *M* denote radius and mass of the earth. If ω is the angular velocity of rotation of the earth about its own axis, then the tension on the string will be ($\cos 0^\circ = 1$)

(a) $\frac{GMm}{R^2}$ (b) $\frac{GMm}{2R^2}$

(c) $\frac{GMm}{2R^2} + m\omega^2 R$ (d) $\frac{GMm}{R^2} - m\omega^2 R$

13. Six very long insulated copper wires are bound together to form a cable. The currents carried by the wires are $I_1 = +10$ A, $I_2 = -13$ A, $I_3 = +10$ A, $I_4 = +7$ A, $I_5 = -12$ A and $I_6 = +18$ A. The magnetic induction at a perpendicular distance of 10 cm from the cable is
($\mu_0 = 4\pi \times 10^{-7}$ Wb/A-m)

(a) 40 μT (b) 37.5 μT (c) 30 μT (d) 35 μT

14. The fundamental frequency of sonometer wire increases by 9 Hz, if its tension is increased by 69 %, keeping the length constant. The frequency of the wire is

(a) 42 Hz (b) 24 Hz (c) 30 Hz (d) 36 Hz

15. In case of dimensions of electric field and electric dipole moment the power of mass is respectively,

(a) 1, 1 (b) 1, 0 (c) 0, 1 (d) 0, 0

16. A potentiometer wire has length *L*. For given cell of emf *E*, the balancing length is $\frac{L}{3}$ from the positive end of the wire. If the length of potentiometer wire is increased by 50%, then for the same cell, the balance point is obtained at length

(a) $\frac{L}{2}$ from positive end (b) $\frac{L}{5}$ from positive end

(c) $\frac{L}{3}$ from positive end (d) $\frac{L}{4}$ from positive end

17. For homogeneous isotropic material, which one of the following cannot be the value of Poisson's ratio?

(a) 0, 1 (b) −1 (c) 0.5 (d) 0.8

18. A mass is whirled in a circular path with constant angular velocity and its linear velocity is *v*. If the string is now halved keeping the angular momentum same, the linear velocity is

(a) $2v$ (b) $\frac{v}{2}$

(c) v (d) $v\sqrt{2}$

19. A circular coil and a square coil is prepared from two identical metal wires and a current is passed through it. Ratio of magnetic dipole moment associated with circular coil to that of square coil is

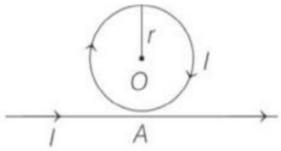
(a) $\frac{2}{\pi}$ (b) $\frac{\pi}{2}$

(c) π (d) $\frac{4}{\pi}$

20. In Young's double slit experiment fifth dark fringe is formed opposite to one of the slit. If *D* is the distance between the slits and the screen and *d* is the separation between the slits, then the wavelength of light used is

(a) $\frac{d^2}{5D}$ (b) $\frac{d^2}{9D}$ (c) $\frac{d^2}{6D}$ (d) $\frac{d^2}{15D}$

21. Figure show the circular coil carrying current I kept very close but not touching at a point A on a straight conductor carrying the same current I. The magnitude of magnetic induction at the centre of the circular coil will be



(a) $\frac{\mu_0 I}{2r}\left(1+\frac{1}{\pi}\right)$ (b) $\frac{\mu_0 I}{2\pi r}$

(c) $\frac{\mu_0 I}{2r}$ (d) zero

22. The vector equation of the plane $\mathrm{r} = (2\hat{\mathrm{i}} + \hat{\mathrm{k}}) + \lambda(\hat{\mathrm{i}}) + \mu(\hat{\mathrm{i}} + 2\hat{\mathrm{j}} - 3\hat{\mathrm{k}})$ in scalar product form is $\mathrm{r}\cdot(3\hat{\mathrm{i}} + 2\hat{\mathrm{k}}) = \alpha$, then $\alpha = \ldots$

(a) 2 (b) 3 (c) 1 (d) 0

23. Area of the region bounded by $y = \cos x$, $x = 0$, $x = \pi$ and X-axis is ...sq. units.

(a) 3 (b) 1 (c) 2 (d) 4

24. The length of the latusrectum of an ellipse is $\frac{18}{5}$ and eccentricity is $\frac{4}{5}$, then equation of the ellipse is ...

(a) $\frac{x^2}{25} + \frac{y^2}{8} = 1$ (b) $\frac{x^2}{25} + \frac{y^2}{9} = 1$

(c) $\frac{x^2}{25} + \frac{y^2}{16} = 1$ (d) $\frac{x^2}{16} + \frac{y^2}{9} = 1$

25. Let $a : \sim(p \wedge \sim r) \vee (\sim q \vee s)$ and $b : (p \vee s) \leftrightarrow (q \wedge r)$. If the truth values of p and q are true and that of r and s are false, then the truth values of a and b are respectively......

(a) F, F (b) T, T (c) T, F (d) F, T

26. "If two triangles are congruent, then their areas are equal" is the given statement then the contrapositive of, the inverse of the given statement is

(a) If areas of two triangles are not equal then they are congruent

(b) If two triangles are not congruent then their areas are equal

(c) If two triangles are not congruent then their areas are not equal

(d) If areas of two triangles are equal then they are congruent

27. $\int \log x \cdot [\log(ex)]^{-2}\, dx = \ldots$

(a) $\frac{x}{1+\log x} + c$ (b) $x(1 - \log x) + c$

(c) $x(1 + \log x) + c$ (d) $\frac{x}{1 - \log x} + c$

28. If $y = \log\left[\frac{x + \sqrt{x^2 + 25}}{\sqrt{x^2 + 25} - x}\right]$ then $\frac{dy}{dx} = \ldots\ldots$

(a) $\frac{1}{\sqrt{x^2 + 25}}$ (b) $\frac{2}{\sqrt{x^2 + 25}}$

(c) $\frac{-1}{\sqrt{x^2 + 25}}$ (d) $\frac{-2}{\sqrt{x^2 + 25}}$

29. If the scalar triple product of the vectors $-3\hat{\mathrm{i}} + 7\hat{\mathrm{j}} - 3\hat{\mathrm{k}}, 3\hat{\mathrm{i}} - 7\hat{\mathrm{j}} + \lambda\hat{\mathrm{k}}$ and $7\hat{\mathrm{i}} - 5\hat{\mathrm{j}} - 3\hat{\mathrm{k}}$ is 272 then $\lambda = \ldots\ldots$

(a) 9 (b) 11 (c) 8 (d) 10

30. The edge of a cube is decreasing at the rate of 0.04 cm/sec. If the edge of the cube is 10 cms, then rate of decrease of surface area of the cube is...

(a) 4.8 cm^2/sec (b) 4.08 cm^2/sec

(c) 48 cm^2/sec (d) 4.008 cm^2/sec

31. The joint equation of lines passing through origin and having slopes $(1 + \sqrt{2})$ and $\frac{-1}{1 + \sqrt{2}}$ is ......

(a) $x^2 + 2xy - y^2 = 0$ (b) $x^2 - 2\sqrt{2}xy - y^2 = 0$

(c) $x^2 - 2\sqrt{2}xy + y^2 = 0$ (d) $x^2 + 2xy + y^2 = 0$

32. If r is the radius of spherical balloon at time t and the surface area of balloon changes at a constant rate K, then......

(a) $4\pi r^2 = \frac{Kt^2}{2} + c$ (b) $8\pi r^2 = Kt + c$

(c) $\pi r^2 = \frac{Kt^2}{2} + c$ (d) $4\pi r^2 = Kt + c$

33. $\int_0^{\frac{\pi}{2}} \sqrt{\cos\theta} \cdot \sin^3\theta\, d\theta = \ldots\ldots\ldots$

(a) $\frac{-20}{21}$ (b) $\frac{-8}{21}$ (c) $\frac{20}{21}$ (d) $\frac{8}{21}$

34. If ω is a complex cube root of unity and $A = \begin{bmatrix} \omega & 0 & 0 \\ 0 & \omega^2 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ then $A^{-1} = \ldots$

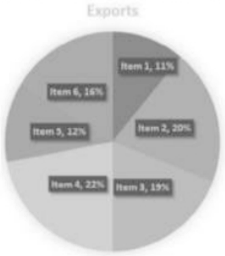
(a) $\begin{bmatrix} \omega^2 & 0 & 0 \\ 0 & \omega & 0 \\ 0 & 0 & 1 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

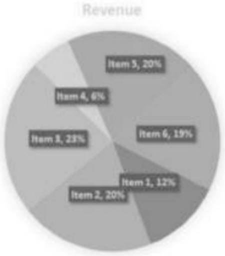
(c) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & \omega^2 & 0 \\ 0 & 0 & \omega \end{bmatrix}$ (d) $\begin{bmatrix} 0 & 0 & \omega \\ 0 & \omega^2 & 0 \\ 1 & 0 & 0 \end{bmatrix}$

(c) Statements 1 and 2 are both required to determine the eldest child.

(d) Statements 1 and 2 are not sufficient to determine the eldest child.

28. The total exports and revenues from the exports of a country are given in the two pie charts below. The pie chart for exports shows the quantity of each item as a percentage of the total quantity of exports. The pie chart for the revenues shows the percentage of the total revenue generated through export of each item. The total quantity of exports of all the items is 5 lakh tonnes and the total revenues are 250 crore rupees. What is the ratio of the revenue generated through export of Item 1 per kilogram to the revenue generated through export of Item 4 per kilogram?





(a) 1 : 2 (b) 2 : 1

(c) 1 : 4 (d) 4 : 1

29. X is 1 km northeast of Y. Y is 1 km southeast of Z. W is 1 km west of Z. P is 1 km south of W. Q is 1 km east of P. What is the distance between X and Q in km?

(A) 1 (b) $\sqrt{2}$

(c) $\sqrt{3}$ (d) 2

30. 10% of the population in a town is HIV^+. A new diagnostic kit for HIV detection is available; this kit correctly identifies HIV^+ individuals 95% of the time, and HIV^- individuals 89% of the time. A particular patient is tested using this kit and is found to be positive. The probability that the individual is actually positive is ______.

31. If ROAD is written as URDG, then SWAN should be written as:

(a) VXDQ (b) VZDQ

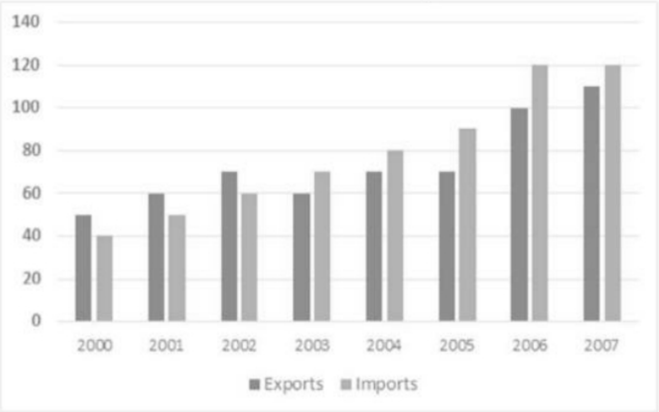
(c) VZDP (d) UXDQ

32. A function $f(x)$ is linear and has a value of 29 at $x = -2$ and 39 at $x = 3$. Find its value at $x = 5$.

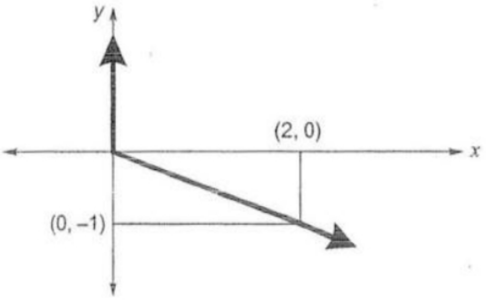
(a) 59 (b) 45

(c) 43 (d) 35

33. The exports and imports (in crores of Rs.) of a country from the year 2000 to 2007 are given in the following bar chart. In which year is the combined percentage increase in imports and exports the highest?



34. Choose the most appropriate equation for the function drawn as a thick line, in the plot below:



(a) $x = y - |y|$

(b) $x = -(y - |y|)$

(c) $x = y + |y|$

(d) $x = -(y + |y|)$

35. The head of a newly formed government desires to appoint five of the six selected members *P*, *Q*, *R*, *S*, *T* and *U* to portfolios of Home, Power, Defense, Telecom, and Finance. *U* does not want any portfolio if *S* gets one of the five. *R* wants either Home or Finance or no portfolio. *Q* says that if *S* gets either Power or Telecom, then she must get the other one. T insists on a portfolio if P gets one.

Which is the valid distribution of portfolios?

(a) P-Home, Q-Power, R-Defence, S-Telecom, T-Finance

(b) R-Home, S-Power, P-Defence, Q-Telecom, T-Finance

(c) P-Home, Q-Power, T-Defence, S-Telecom, U-Finance

(d) Q-Home, U-Power, T-Defence, R-Telecom, P-Finance

36. Four cards are randomly selected from a pack of 52 cards. If the first two cards are kings, what is the probability that the third card is a king?

(a) $\frac{4}{52}$ (b) $\frac{2}{50}$

(c) $\left(\frac{1}{52}\right)\times\left(\frac{1}{52}\right)$ (d) $\left(\frac{1}{52}\right)\times\left(\frac{1}{51}\right)\times\left(\frac{1}{50}\right)$

37. Mr. Vivek walks 6 meters North-East, then turns and walks 6 meters South-East, both at 60 degrees to East. He further moves 2 meters South and 4 meters West. What is the straight distance in meters between the point he started from and the point he finally reached?

(a) $2\sqrt{2}$ (b) 2

(c) $\sqrt{2}$ (d) $\frac{1}{\sqrt{2}}$

38. Read the following table giving sales data of five types of batteries for years 2006 to 2012

Year	Type I	Type II	Type III	Type IV	Type V
2006	75	144	114	102	108
2007	90	126	102	84	126
2008	96	114	75	105	135
2009	105	90	150	90	75
2010	90	75	135	75	90
2011	105	60	165	45	120
2012	115	85	160	100	145

Out of the following, which type of battery achieved highest growth between the years 2006 and 2012?

(a) Type V (b) Type III

(c) Type II (d) Type I

39. How many four digit numbers can be formed with the 10 digits 0, 1, 2, ... 9 if no number can start with 0 and if repetitions are not allowed?

40. The given question is followed by two statements; select the most appropriate option that solves the question

Capacity of a solution tank A is 70% of the capacity of tank B. How many gallons of solution are in tank A and tank B?

Statements:

I. Tank A is 80% full and tank B is 40% full.

II. Tank A if full contains 14,000 gallons of solution.

(a) Statement I alone is sufficient.

(b) Statement II alone is sufficient.

(c) Either statement I or II alone is sufficient.

(d) Both the statements I and II together are sufficient.

41. There are 16 teachers who can teach Thermodynamics (TD), 11 who can teach Electrical Sciences (ES), and 5 who can teach both TD and Engineering Mechanics (EM). There are a total of 40 teachers. 6 cannot teach any of the three subjects, i.e. EM, ES or TD. 6 can teach only ES. 4 can teach all three subjects, i.e. EM, ES and TD. 4 can teach ES and TD. How many can teach both ES and EM but not TD?

(a) 1 (b) 2

(c) 3 (d) 4

42. Consider a function $f(x) = 1 - |x|$ on $-1 \leq x \leq 1$. The value of x at which the function attains a maximum, and the maximum value of the function are:

(a) 0, – 1 (b) –1, 0

(c) 0, 1 (d) –1, 2

5.2

CHAPTER

UGEE 2019 SOLUTIONS

Answers of UGEE 2019 SUPR

1	A	11	D	21	*	31	A	41	B
2	C	12	D	22	A	32	D	42	B
3	B	13	A	23	C	33	D	43	C
4	D	14	C	24	B	34	A	44	C
5	C	15	B	25	A	35	D	45	B
6	B	16	A	26	D	36	A	46	C
7	D	17	D	27	A	37	D	47	D
8	A	18	A	28	B	38	D	48	B
9	B	19	D	29	B	39	A	49	A
10	B	20	B	30	A	40	C	50	D

Answers of UGEE 2019 REAP

1	B	11	140	21	B	31	B
2	22	12	A	22	180	32	C
3	B	13	C	23	D	33	4.54
4	96	14	C	24	B	34	B
5	D	15	D	25	25	35	B
6	850	16	C	26	A	36	B
7	48	17	C	27	A	37	A
8	B	18	C	28	D	38	D
9	C	19	1300	29	C	39	4536
10	D	20	D	30	0.4896	40	D
						41	A
						42	C

DETAILED SOLUTIONS

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IIITPREP

UGEE 2019 SOLUTIONS

DISCLAIMER

We want to clarify that the **2018 and 2019 questions** in this Book are not actual UGEE PYQs. At the time, exact questions were unavailable, so we included **similar ones sourced** from exams like GATE. Interestingly, some turned out to be quite close to what was actually asked.

From 2020 onwards (2020–2025 and upcoming), **the questions are accurate**, based on inputs from a larger number of students. This is shared to maintain transparency and trust.

UGEE 2020 MEMORY BASED PAPER

IIITPREP PUBLICATION

UGEE 2020 Paper Pattern

PAPER	No. of Que	Time	Marking	Total Marks	Negative Marking
UGEE 2020	100	3 hr		150	
SUPR	50	1 hr	+1	50	0
REAP	50	2 hr	+2	100	-0.5

TIME : 3 HRS *TOTAL MARKS : 150*

1. A Sample taken by a chemist has 500 gm of $CaCO_3$ dissolved in an aqueous solution of 500 ml, what will be the molarity of the solution which will be prepared?

A. 5 M
B. 10 M
C. 15 M
D. 20 M

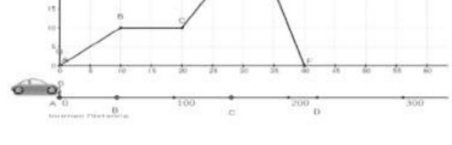
2. Approximately how much portion of Bohr's Atomic Model is vacant?

A. 99.99 %
B. 99.9 %
C. 99.9999 %
D. 99 %

3. If 2p orbital has n =2 and has capacity of 6 electrons then the shell having slightly higher energy than 3p is?

A. 2p
B. 3d
C. 3s
D. 4s

4. If displacement Vs Time Graph is as follows. Predict other nature of the same motion.



Few graphs of v-t were provided in the options.

5. A question on K, L, M, N shells.
If K, L, M, N shells of an atom are full then the total number of electrons in that atom are?

A. 60
B. 18
C. 50
D. 36

6. Ratio of masses of 2 bodies are 1:1 and the ratio of time period is 1:8 then calculate the ratio of the length of their semi major axes respectively.

A. 1:4
B. 1:2
C. 1:8
D. 1:12

7. As per Einstein's energy equation $E=mc^2$, find the statement which is incorrect.

A. Mass disappears to reappear as energy
B. Energy disappears to reappear as mass
C. Mass and energy are two different forms of the same entity
D. Mass and energy cannot be related to each other

8. A packed vessel has monatomic gas which was later converted to diatomic gas by a special instrument. What would be its C_v and degree of Freedom?

A. 1.5R, 3
B. 2.5R, 5
C. 3.5R, 7
D. 7R, 7

75. A body has potential which follows the equation $V = x^2 + y^2 - xy$. Find its kind of motion after releasing it from rest from (1/2, 1/2)?

A. Constant acceleration
B. Circular motion
C. Constant retardation
D. Elliptical motion with acceleration

76. Find the number of solutions for the given equation $x^3 = 3x^2 + 2$?

A. 1
B. 2
C. 3
D. No solution

77. In $(x + y + z)^9$ find Coefficient of $x^3y^4z^2$?

A. 9! / (3! 4! 3!)
B. 9! / (3! 4! 2!)
C. 9! / (3! 4! 4!)
D. 9! / (2! 2! 3!)

78. Find the minimum frequency required to lose contact of the ball in oscillation where the spring constant is 50 and mass is 500 kg?

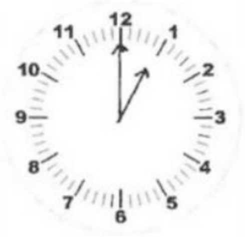
A. 3/π
B. 4/π
C. 5/π
D. 6/π

79. How many garlands can be made of black & white beads? If each color is having 5 units and all beads are considered as different and only 7 beads are to be used.

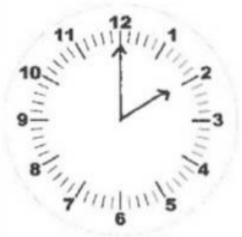
A. $^{10}C_7.7!/2$
B. $^{10}C_7.7!$
C. $^{10}C_7.6!$
D. $^{10}C_7.6!/2$

(80- 84) The Estonian Time is expressed.

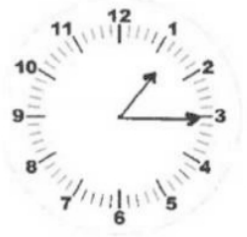
The following expressions show how to tell the time in Estonian:



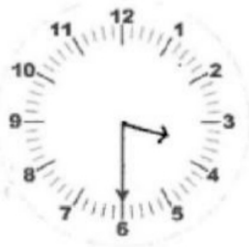
Kell on üks 'It's 1:00'



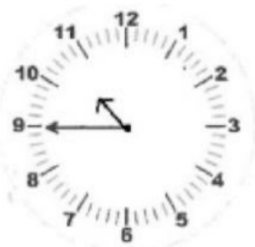
Kell on kaks 'It's 2:00'



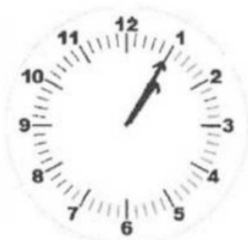
Veerand kaks '1:15'



Pool neli '3:30'



Kolmveerand üksteist '10:45'



Viis minutit üks läbi '1:05'

Here are some numbers in English and Estonian:

6 kuus 7 seitse 8 kaheksa 9 üheksa 10 kümme

QUE. Translate the following times into Estonian:

80. 8 :45 =? **81.** 4:15 =? **82.** 11:30 =? **83.** 7:05 =? **84.** 12:30 =?

IIITPREP UGEE 2020 PAPER ANSWER KEY

Answers of UGEE 2020 SUPR

1	B	11	C	21	B	31	D	41	Error
2	C	12	A	22	A	32	A	42	C
3	D	13	B	23	B	33	B	43	C
4	A	14	A	24	A	34	D	44	D
5	A	15	B	25	B, D	35	C	45	A
6	A	16	B	26	A	36	A	46	D
7	C	17	B	27	C	37	B	47	B
8	B	18	C	28	B	38	D	48	A
9	A	19	C	29	A	39	C	49	A
10	B	20	B	30	C	40	D	50	B

Answers of UGEE 2020 REAP

51	E	61	-	71	D	80	Kolmveerand uheksa
52	A	62	D	72	B	81	Veerand viis
53	Try on own	63	A	73	B	82	Pool kaksteist
54	u cto fi	64	C	74		83	Viis minutit seitse labi
55	Dew ece fo	65	B	75	A	84	Pool uks
56	2,1,4,3,6,5,7	66	B	76	A		
57	D	67	C	77	B		
58	D	68	C	78	C		
59	B	69	D	79	D		
60	C	70	C				

6.2

CHAPTER

UGEE 2020 SOLUTIONS

1) Correct Answer → (B) 10 M

Molarity = $\frac{\textit{Number of moles}}{\textit{Volume of solution (in litre)}}$

M = $\frac{500 \; X \; 1000}{100 \; X \; 500}$ = 10 M

2) Correct Answer → (C) 99.9999%

NCERT Statement.

3) Correct Answer → (D) 4s

Order of energy is given by:

4p > 3d > 4s > 3p > 3s > 2p > 2s > 1s

4) Correct Answer → (A)

Slope of x, t Graph gives velocity V

$$V = \frac{dx}{dt}$$

5) Correct Answer → (A) 60

Total number of electrons in a shell having principal quantum number "n" is given as "$2n^2$".

∴ Total number of electrons = $2\,(1^2 + 2^2 + 3^2 + 4^2) = 60$

6) Correct Answer → (A) 1: 4

According to Kepler's third law of planetary motion,

$$T \propto a^{3/2}$$

Where "T "is the time period and "a "is the length of the semi – major axis.

$$\therefore \; \frac{a_1}{a_2} = \left(\frac{T_1}{T_2}\right)^{2/3} = \left(\frac{1}{8}\right)^{2/3} = 1:4$$

7) Correct Answer → (C)

Mass and energy are interrelated using Einstein's equation, $E = mc^2$

8) Correct Answer → (B) 2.5R, 5

For a Diatomic Gas, δ (degree of freedom) = 5

$Cv = \frac{\delta R}{2} = \frac{5R}{2} = 2.5R$

9) Correct Answer → (A) 8

This is the representation of CsCl structure where the co-ordination number is 8.

For Cs^+=> Cl^- ions

And,

For Cl^- => 8 Cs^+ ions form the nearest neighbor.

10) Correct Answer → (B) 1/4

Required probability = 1 – probability of getting an odd number on the cube.

$$P = 1 - \left\{\frac{3}{10} + \frac{1}{10} + \frac{1}{10} + \frac{1}{10} + \frac{2}{10}\right\}$$

$$P = 1 - \frac{15}{20} = \frac{5}{20} = \frac{1}{4}$$

c)10

d) 9

e) 8

Q-7) If in an isobaric process, no heat is supplied to the system then find the correct options regarding the process?

a) w=-pΔv, ΔU=nCvdt

b) w=-pΔv, ΔU=Q-pΔv

c) w= pΔv, ΔU=0

d)Data Insufficient

e) None of the above

Q-8) Which of the following quantum numbers are possible? (n,l,m,s)

a) 3, 4, 3, -1/2

b) 3, 3, 2, +1/2

c) 1, 0, 1, -1/2

d) 3, 1, 0, +1/2

e) None of the above

Q-9) f(x) = x^2 for 0≤ x ≤1,

f(x) = 1/x for x < 0

f(x) = 0 for x > 1

Then, which of the following is correct regarding f(x)?

a) f(x) is differentiable at 0 and 1

b) f(x) is not differentiable at 0 and 1

c) f(x) is differentiable at 0 but not differentiable at 1

d) f(x) is not differentiable at 0 but differentiable at 1

e) Data Insufficient

Q-10) In a harmonic oscillator, in order to double the harmonic frequency, what should be the change in mass attached to the spring?

a) Mass should be reduced by 4 times
b) Mass should be reduced by 2 times
c) Mass should be reduced by 8 times
d) Mass should be reduced by16 times
e) Mass should be reduced by 32 times

Q-11) A rectangular loop is placed in the magnetic field B = i - j and the four corners of the rectangular loop have the following coordinates: A = (5, 0, 0), B = (0, 5, 10), C = (5, 0, 10) D = (0, 0,10). Then, find the total flux through the rectangular loop? (Where all lengths have been given in SI unit)

a) 25 Wb
b) 50 Wb
c) $20\sqrt{2}$ Wb
d) $10\sqrt{2}$ Wb
e) None of the above

Q-12) Calculate the mean free path for oxygen molecules at a temperature of 27°C and pressure 1.01×10^5 Pa. Assume the molecular diameter as 0.3 nm and the gas are ideal. (K = 1.38×10^{-23}).

a)102 nm

b)104 nm

c) 98 nm

d) 106 nm

e) None of the above

Q-13) 2kg of water at 80°C is mixed with 8 kg water at 20°C. Half of the resultant solution is mixed with 15 kg water at 36°C and the other half is mixed with 15 kg water at 24°C and finally all the proportions are mixed together. Find the resultant temperature.

a)50

b)32

c)38

d)28

e) 30.5

Q-14) ΔH<0, S<0 where H and S stand for enthalpy and entropy respectively, then will the reaction be spontaneous?

a.) spontaneous at low temperature

b) will never be spontaneous

c) spontaneous at high temperature

d) spontaneous at sufficiently low temperature

e) Data Insufficient

Q-15) A coin is tossed 5 times. Consider head and tail to be written in binary notation as 1 and 0 respectively. Find the probability of having binary 101.

a)4/2187

b)8/4374

c) 11/2187

d)13/2187

e) 11/32

Q-16) A curve is given by the equation x=e^{θ} $sin\ sin\ \theta$ and y= e^{θ} $cos\ cos\ \theta$. Find the length of the curve between $\theta = 0$ and Θ= π/2?

a) 25
b) 20
c) 15
d) 12
e) None of the above

Q-17) The equation of the line through the point (0,1,2) and perpendicular to the line $\frac{x-1}{2} = \frac{y+1}{3} = \frac{z-1}{-2}$ is:-

a)$\frac{x}{3} = \frac{y-1}{4} = \frac{z-2}{-3}$

b) $\frac{x}{-3} = \frac{y-1}{4} = \frac{z-2}{3}$

c) $\frac{x}{3} = \frac{y-1}{-4} = \frac{z-2}{3}$

d) $\frac{x}{3} = \frac{y-1}{4} = \frac{z-2}{3}$

e) None of the above

Q-18) If dy/dx =a(x/y) for x, y belonging to the set of real numbers. Then the given equation represents a hyperbola for which of the following conditions?

a) Any positive real value of a
b) Any negative real value of a
c) For a=0

d)For all real values of a

e) None of the above

Q-20) If two vectors along the edges of a parallelopiped are 4i-j+7k and 3i+2j+5k respectively then the expression of the third vector for which the volume of the parallelepiped is 0 will be?

a) i+9j+k

b) 5j+6k

c) 7k

d) 2i+3j+4k

e) None of the above

Q-22) If the two vectors along the edges of the parallelopiped are 16i+16j+8k and 3i-4j+8k. if Area of parallelogram is given by A, then find the value of A/6?

a)$8\sqrt{2}$

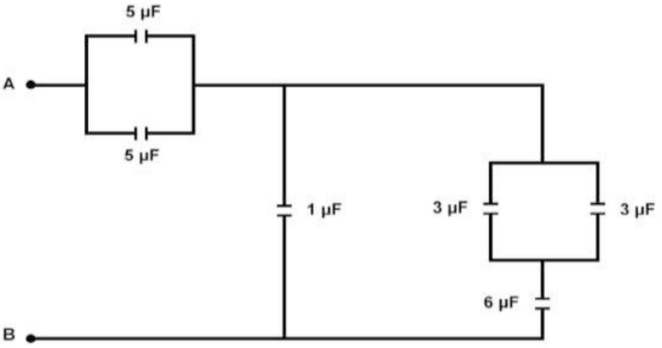
b)$4\sqrt{2}$

c)$3\ \sqrt{2}$

d)$2\sqrt{2}$

e)$\sqrt{1360}$

Q-23) Find the equivalent capacitance of the circuit.



a)20/17

b)1/3

c)4/17

d)20/7

e) None of the above

Q-24) CO, CN, NF, NO, N_2. Which of the above species will stabilise?

i) after losing an e^- ?

a) CN

b) CO

c) NF

d) NO

e) N_2

ii) after gaining an e^-?

a) CN

b) CO

c) NF

d) NO

e) N_2

Q-25) If the new kinetic energy is 16 times the original one, then find the new De-Broglie wavelength.

a) 1/4 times the original De-Broglie wavelength

b) 4 times the original De-Broglie wavelength

c) 8 times the original De-Broglie wavelength

d) 1/8 times the original De-Broglie wavelength

e) Data Insufficient

Q-26) What should be the equation of a line passing through the point (1, 2) and perpendicular to the line $y = 3x - 1$?

a) $x+3y+7 = 0$
b) $x+3y-7 = 0$
c) $x+3y = 0$
d) $x-3y = 0$
e) None of the above

Q-27) $f(x)=cx^{2/3}$. If Rolle's theorem is applicable on f(x) in the interval [0,2]. Find C.

a) 0
b) 1
c) 2
d) 3
e) 4

Q-28) *Evaluate* $\int_0^{\frac{\pi}{2}} \frac{\sqrt{sinx}}{\sqrt{sinx}+\sqrt{cosx}}$

a) $\frac{\pi}{2}$

b) $\frac{\pi}{4}$

c) $\frac{\pi}{6}$

d) $\frac{\pi}{8}$

e) None of the above

Q-29) *Find* $\int_0^1 \frac{x}{x^2+4x+3}$

a) $1\sqrt{2}$
b) $2\sqrt{2}$
c) $3\sqrt{2}$
d) 4
e) None of the above

Q-30) A Carnot engine working in the range of 400K to 800K gives an output power of 1200J. What is the power input?

a) 300J

b) 400J

c) 500J
d) 2400J

e) 2800J

Q-31) Evaluate $\lim_{x\to\infty} \frac{x^2-x-2}{x^2-4x+4}$ =?

a)0

b)1

c)-1

d)$-\infty$

e) None of the above

Q-32) Two identical blocks of the same metal having the same mass are maintained at temperatures T1 and T2 respectively. They are brought in contact with each other and allowed to attain thermal equilibrium at constant pressure. The change in entropy, ΔS, for this process is:

a) $C_p \ln \left[\frac{(T1+T2)^2}{4T1T2}\right]$
b) $C_p \ln \left[\frac{(T1+T2)^2}{T1T2}\right]$

c) $C_p \ln [\frac{(T1+T2)^4}{4T1T2}]$
d) $C_p \ln [\frac{(T1+T2)}{4T1T2}]$
e) None of the these

Q-33) Let P be any point on the curve $x^{2/3}+y^{2/3}=a^{2/3}$. Then, what would be the length of the segment of the tangent between the coordinate axes?

a) a
b) 2a
c) 3a
d) 4a
e) 5a

Q-34) A= $\begin{bmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ 3 & 2 & 1 \end{bmatrix}$. Find the determinant value of $(A^2 + I)(A + I)^{-1}$?

a) 5

b) 6

c) 1

d) 9

e) None of the above

Q-35) $Na_2B_4O_7.10H_2O \xrightarrow{A} H_3BO_3 \xrightarrow{B} B_2O_3$. Find the reagents A and B respectively.

a) A= HCl+ heat, B= Heat
b) A= Heat, B= Heat
c) A= HCl, B= Heat
d) A= HCl+ water, B= Heat
e) None of the above

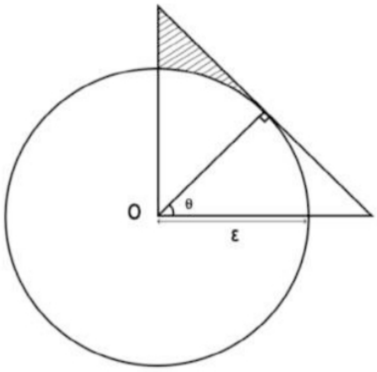
Q-36) Evaluate $\lim_{x\to 0}(\frac{1+ax}{1-bx})^{\frac{1}{x}}$?

a) e^{a-b}
b) 1
c) e
d) $b-a$
e) e^{a+b}

Q-37) Which of the following statements is correct regarding N_2^- & N_2^+ ions?

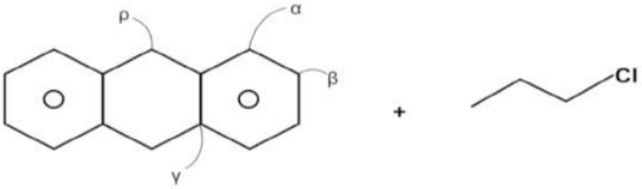
a) Both have the same bond order
b) Both have the same bond length
c) Both are paramagnetic
d) Both are diamagnetic
e) Both have different Bond length

Q-38) Find the area of the shaded region if the radius of the circle is 1 cm.



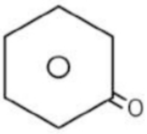
a) $1cm^2$
b) $2\ cm^2$
c) $4\ cm^2$
d) $8\ cm^2$
e) None of the above

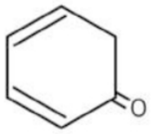
Q-39) Find the position on the Benzene derivative, where propane will get attached.



a) ∝
b) β
c) γ
d) δ
e) Propane will not get attached

Q-40) Which of the following has the maximum enol content?

a) 

b) 

c) CH_3 - CO - CH_3

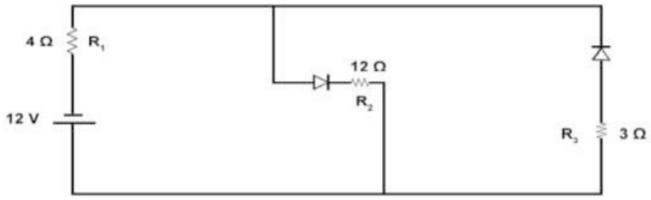
d) CH_3 - CO - CH_3 - CO - CH_3

a) A
b) B
c) C
d) D
e) None of the above

Q-41) Find the set S from the following options which contain the root of the polynomial $1 + x + x^2 + x^3 + \ldots + x^n$

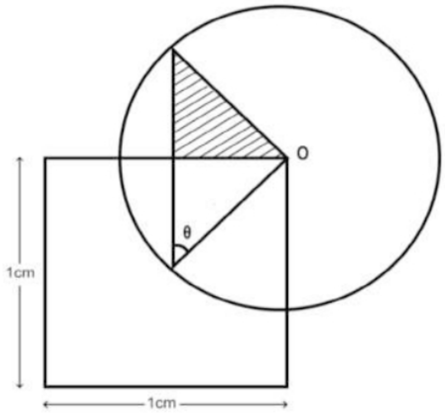
a) {0}
b) {0,1, -1}
c) {0, n+1th roots of unity} - {1}
d) {0,1}
e) None

Q-42) Find the current through the 4-ohm resistor mentioned in the diagram.



a) 12/7
b) 2/7
c) 3/7
d) 4/7
e) None of the above

Q-43) Find the area of the shaded region, if the circle is of radius 0.5 cm with centre at O.



a) 4.5 cm^2
b) 4.8 cm^2
c) 5.6 cm^2
d) 6.8 cm^2
e) None of the above

Q-44) Two persons A and B mark three balls independently with number 1, 2 and 3 respectively. What is the probability that at least one of the balls is marked by the same number by both A and B?

a)2/3

b)1/3

c)2/5

d)5/3

e) None of the above

Q-45) Eight ants are present at the eight corners of the cube. Each ant starts to move towards its adjacent corner. Find the probability such that no two ants collide with each other?

a) 4/2187
b) 2/2187
c) 8/729
d) 9/4374
e) 8/2187

Q-46) If the reaction $C_2H_4 + H_2$ gives C_2H_6, $\Delta H^\circ = -x$ kJ/ mol $\Delta S^\circ = (-x + 72)$ kJ/mol. Then what is the condition for the reaction to be spontaneous?

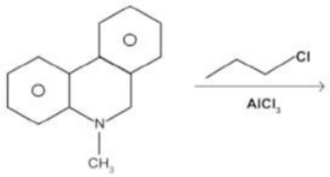
a) Low temperature will be favourable for a spontaneous reaction
b) High temperature will be favourable for a spontaneous reaction
c) Low pressure will be favourable for a spontaneous reaction
d) High Pressure will be favourable for a spontaneous reaction
e) None of the above

Q-47) A resistor develops 500J of heat energy in 20 seconds when 1.5A current is passed through it. Now if the current is increased from 1.5 A to 3 A, what will be the heat energy developed in 20 seconds?

a) 2000 J
b) 3000J
c) 300 J
d) 4000 J
e) None of the above

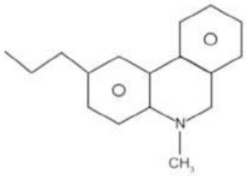
Q-48)

Q)



What would be the major product in this reaction?

a)



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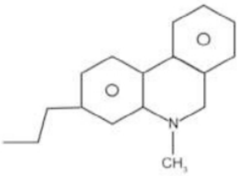
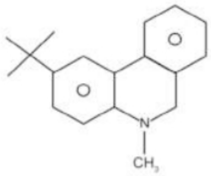


c)



d) None of these.

REAP SECTION

(1-2) A factory produces two types of products X and Y. The price of the two products in the market are 7 and 4 Rupees respectively. There are two machine A and B. X requires 3 hours of both machines A and B, Y requires 2 hours of A and 1 hour of B. A and B can be used for 12 and 8 hours per day, respectively. Let the number of units of X that should be produced be α and the number of units of Y that should be produced be β. Given that the owner needs to maximize his profit.

1. What is the value of α? ______.
2. What is the value of β? _______.

Q-3) A factory produces a product which has a market value of Rupees 110. The production cost follows the function of x as f(x) =$x^2 + 60x$, where x is the number of units produced. Factories can produce a maximum of 30 units per day. How many units should be produced to maximize the profit?

a)20

b)30

c)25

d)27

e) None of the above

Q-4) A Sheriff is finding the Robin Hood in the neighbourhood of 3 houses. Mr. RED says he is in his House, Mrs. GREEN says he is not in her house, Mr. WHITE says Mr. RED is lying. If Mr. RED is lying then Mr. GREEN is also lying and if either of Mr. RED and Mr. GREEN is lying then Mr. WHITE is also lying. Then Robin Hood would actually be in whose house?

a) Mr. Red's
b) Mr. Green's
c) Mr. White's
d) Not in the neighbourhood
e) Data Insufficient

Q-5) A person has taken a loan of 5 lakhs from a bank at an interest rate of 5%. He wants to invest the money in 2 companies A and B, where A gives him 12% interest rate, while B gives him 8% interest rate but B is more stable than A. How much should he invest in A to get a profit of 25,000 with minimum risk?

a)2 lakh

b)3 lakh

c)2.3 lakh

d)2.5 lakh

e)2.75 lakh

Q-6) There is a particular breed of animals which is affected with a unique disease. If it is brought near and kept within a shed with remaining 20 animals, the number of animals affected due to the disease is equal to product of number of animals before being affected and number of animals that got affected respectively. Find a relationship for number of animals being affected (as a function of time t) after time "t".

a) y=20(1+ae^{-bt})
b) y=20/ae^{-bt}

c) y=20/1+ae^{-bt}

d) y=20(1-ae^{-bt})

e) None of the above

Q-7) A Professor says that an instrument has 3 nozzles. One nozzle inputs nitrogen, another one gives out cold nitrogen, another one gives out hot nitrogen. Is the above-mentioned setup thermodynamically possible? If yes, then which of the following options correctly states the reason:

____

Q-8) Find the missing term in the series

20, 86, 27, 72, 48, ____, 83

a)60

b)64

c)66

d)72

e) 44

Q-9) Find the missing term in the series:

3, 8,15, 26, ____, 80, 147

a) 45

b) 38

c) 54

d) 68

e) None of the above

Q-10) There are 3 friends Ari, Biju and Charu. They go to three different colleges namely 'A' , 'B' and 'C'. A college can provide courses in Electronics, Computer Science or Mechanical Engineering. No two of the friends can have the same course. Ari can't study in 'A' and Biju can't study in 'B'. The friend studying in 'B' is doing electronics. Friend in 'A' cannot do Computer Science. Biju is not doing Mechanical Engineering. Where is C and what is she doing?

a) At A, doing Mechanical

b) At A, doing Electronics

c) At B, doing Mechanical

d) At C, doing Computer science

e) At C, doing Electronics

Q-11) In a hydrogen atom, approximately, how many times (in order of 10) does an electron revolve around the nucleus in a second?

a)1

b)1000

c)10^{17}

d)10^{9}

e) None of the above

Q-12) Which of the following functions from f: N →N are not one-one but are onto functions?

a) y=x

b) $y=x^2$

c) y=x-1 if x is odd

y=x+1, if x is even

d) y= $[\sqrt{x}\ ]$, where [.] is the greatest integer less than or equal to root(x)

e) None of the above

(Q13- 14) In some code the word EXAM is written as OVSG and TEST is written as ZOAZ then, answer the following three questions:

13. The word ANSWER is written in that code as: _________

14. SFAWOB Which two letters are coded the same as itself? ___ & ___

15. The code JSDSF symbolises which word?

____

Q-16) If two men took one card each (i.e., both of them together took 2 cards) from a deck of 52 cards. After they took the cards and saw it, they replaced and reshuffled the cards. Then, the two repeated the same process again. Find the probability of getting a different card the second time which is not the same as the first time for each individual?

a)5/12

b)1/2

c) 3/4

d)2/3

e) None of the above

Q-17) If the spin magnetic quantum number m = +1/2, - 1/2 and 0, then what are the atomic numbers of the first three noble gases?

a) 3, 15, 27
b) 4, 16, 27
c) 3, 15, 36
d) 4, 15, 27
e) None of the above

Q-18) If the length of two equal arcs of a circle is L such that $\pi r \le L \le 3\pi r$. If the angle between the lines joining the midpoint of curve and the centre of the circle is ϴ. Then find the probability that the union of two arcs form a complete circle?

a) $L/2\pi R$

b) $L/\pi R$

c)$1- L/\pi R$

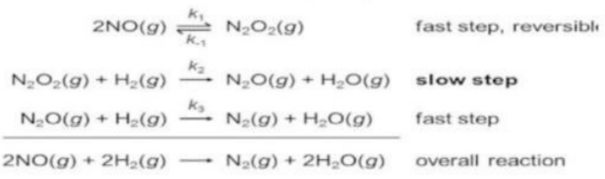
d $L/2\pi R$ -1

e) $\pi R^2/L$

Q-19) Which energy level of single ionised carbon atom has the same energy as that of the ground state energy of a hydrogen atom?

a) 2
b) 3
c) 4
d) No such energy level
e) None of the above

Q-20) A Chemical reaction takes place through different steps out of which some are slow and some are fast. Which of the following options are correct?


$2NO(g) \underset{k_{-1}}{\overset{k_1}{\rightleftharpoons}} N_2O_2(g)$
fast step, reversibl
$N_2O_2(g) + H_2(g) \xrightarrow{k_2} N_2O(g) + H_2O(g)$
slow step
$N_2O(g) + H_2(g) \xrightarrow{k_3} N_2(g) + H_2O(g)$
fast step
$2NO(g) + 2H_2(g) \longrightarrow N_2(g) + 2H_2O(g)$
overall reaction

a) Rate of reaction is proportional to $K_1[NO]^2$

b) rate =K $[N_2O_2]$ $[H_2]$

c) rate of reaction depends only on the fast steps of the reaction

d) all of the above

e) Data Insufficient

Q-21) Things made by metals are stronger than rocks. The following theories have been proposed to justify the statement. Which of them is most appropriate?

a) bonds in metals are stronger than in stones

b) atoms in metals are stronger than atoms in rocks

c) in metals the atoms are closely packed and the force is exerted by the surrounding atoms so it will be stronger than stone

d) the creator wants the metals to be strong

e) None of the above

Q-22) In a college there are "m" students and "n" courses and 'P' is a matrix of order m×n respectively and P_{ij} represents that student 'i' takes course 'j' in the college. Then what does the expression, $(P^T \times P)_{kl}$ represent? (Where T=transpose and $_{kl}$ is same as $_{ij}$ in P_{ij})

a) 'k' is the student whereas 'l' is not the student in the college

b)'k' and 'l' are the courses in the college

c)either 'k' or 'l' are the students of the college

d)'l' is a student of the college and 'k' is a course in the college

e)'l' is a course in the college whereas 'k' is not the student of the college

Q-23) There are three people A, B and C playing cricket. Among them there is a captain, a wicket keeper and an all-rounder. If A is not the wicket keeper, B is not an all-rounder and then C is an all-rounder, given that only one of the statements is correct. Then which of the following options is correct?

a) A-captain, B-wicket keeper, C-allrounder

b) A-captain, B-allrounder, C-Wicket Keeper

c) A-allrounder, B-wicket Keeper, C-allrounder

d) A-wicket keeper, B-captain, C-allrounder

e) Data Insufficient

Q-24) Find P(X>1) for P[x=k] = $e^{-\alpha}(\frac{\alpha^k}{k!})$ where P(x) stands for the probability of event x?

a) 0.5
b) 0.3
c) 0.2
d) 0.1
e) None of the above

Q-25) In the acidic form, an acid-base indicator with (K_{in} of 3×10^5) can be in red and blue colour in their different states. By how much must the pH change, in order to change the indicator from 90% of one colour to the other colour?

a)10

b) 1.92

c) 8

d)6

e) 5

Q-26) A rectangular wall has to be painted from x=0 to x=100. Height(h) of the wall as the function of x is given as x=ahe^{-abx} and h is given in terms of x. Painting per unit of wall costs 20 Rupees. Find the area covered with a budget of 1 lakh Rupees?

a)$10ahe^{-ab}$

b)$20ahe^{-ab}$

c)$25ahe^{-ab}$

d)$45ahe^{-ab}$

e) None of the above

(27-28) Two atoms are brought close to each other from infinity and at first, they attract each other till r = r_o with a force proportional to r^m and after coming closer they start repelling each other with a force proportional to r^n. Answer the questions which follow.

27. What should be the relation between m and n?

a) m=n

b) m>n

c) m<n

d) m = 2n

e) None of the above

28. What should be the nature of charges?

a) One atom is positively charged whereas the other one is negatively charged
b) Both the atoms are positively charged
c) Both the atoms are negatively charged
d) Data Insufficient
e) None of the above

Q-29) When two atoms A and B, initially at r >> r_o, come closer to each other till r=r_o, where r_o is the equilibrium position of the internuclear distance where the attractive force is equal to repulsive force. Then, at the equilibrium position the potential energy will be?

a) Minimum
b) Maximum
c) Remains Constant
d) None of the Above
e) Data Insufficient

Q-30) The strength of the magnetic field of a horseshoe magnet is maximum at which of the following positions?

a) Between its ends

b) Close to the bends on the inside

c) Close to the bends on the outside

d) Along the sides of the magnet

e) Everywhere the strength is the same

Q-31) The wings of Boeing 787 plane are slightly raised from the horizontal level. There are four forces acting on the aeroplane which include the drag force, lift force, buoyant force and the gravitational force. One of these forces might be the reason behind the tilt in the wings of the plane. Which of the following options gives the best explanation for this?

a) to reduce the drag force
b) to provide more thrust force
c) it is just a random idea of the company to make planes like this
d) All of the above
e) Lift Force

Q-32) There are 5 holes on a wall and a total of 17 pigeons have to be kept in them. Which of the following options(choices) are correct and can be the best suitable arrangement?

a) Every filled/occupied hole has a minimum of 3 pigeons

b) Every filled /occupied hole has at least 2 pigeons but not

more than 4 pigeons

c) Every filled/occupied hole has not less than 2 pigeons

d) All of the above

e) The filled/occupied holes have not less than 4 pigeons

Q-33) Find the missing term in the following series.

20, 86, 27, 72, 48, __, 83

a) 56

b) 46

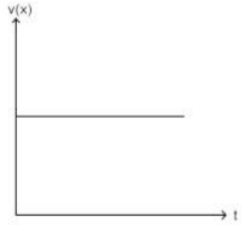
d) 44

e) 68

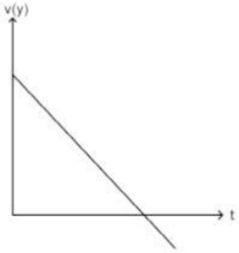
f) None of the above

Q-34) A body is projected at some angle θ with the positive direction of the x axis. Find the variation of velocity along the x axis as V(x) and velocity variation along the y axis as V(y) with respect to time, respectively, from the following given graphs?

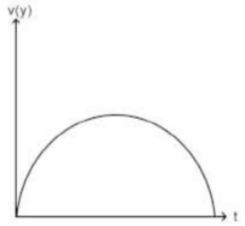
a)



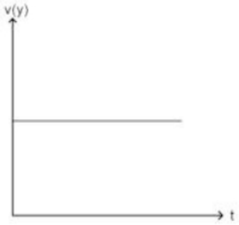
b)



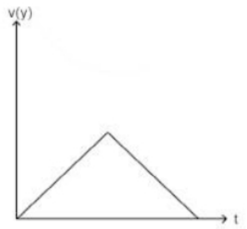
c)



d)



e)



a) A & D
b) B & C
c) C & D
d) D & E
e) A & B

Q-35) **Statement 1 -** Cow dung is the divine source of life. It gives birth to flies.

Statement 2 - The flies lay eggs in the cow dung. The conditions present in the dung are favourable for their growth.

Which of the following most accurately allows one to come to a certain conclusion in the light of the above statements?

a) Read a book regarding traditional belief on Cow dung.
b) Perform a religious ritual around the Cow dung.
c) Derive a mathematical equation on the number of flies coming out of the cow dung.
d) Visit a scientist and ask him about this.

e) Visit the cow dung regularly and count the number of flies around it.

Q-36) A group of eagles are moving in a circle of radius R at a height R from the surface of the Earth. Also, a group of men are standing and watching them too in a circular geometry. What is the radius of the circle in which the people are standing and watching the eagles? If θ is angle on inclination between them

a) $R + R \cot \theta$
b) $R + R \tan \theta$
c) $R \cot \theta$
d) $R \tan \theta$
e) None of the above

Q-37) A crow flies in the sky at a height of 'R' and people standing in a circle on the ground are watching it. It flies at an angle θ such that when it comes down its distance from all the people are equal. Then, find the radius of the circle.

a) $R + R \cot \theta$

b) $R + R \tan \theta$

c) $R \cot \theta$

d) $R \tan \theta$

e) None of the above

Q-38) When a hydrogen gas containing balloon is released from rest, it goes upward. But when a solid ball is released, it goes downward. What could be the best possible explanation for this phenomenon?

a) Hydrogen containing balloon rolls and topples in the air while the solid ball doesn't
b) Density of the material of the ball is more than the density of the material of the balloon
c) Net force on the balloon is in the upward direction whereas on the solid ball it is in the downward direction
d) This fact is not true
e) None of the above is suitable

Q-39) It is a well-known fact that the growth in living beings stop after a certain age. What could be the best possible explanation for the above-mentioned phenomenon?

a) In old age people don't eat food properly and therefore don't get sufficient nutrition for further growth
b) The body is built naturally such that release of growth hormones and chemicals decrease after a certain age
c) Old age people's mind is involved in other necessary activities and therefore it stops releasing growth hormone
d) Old age people lose control over their mind
e) None of the above is a suitable option

Q-40) **Statement 1 -** Cu has larger size than K

Statement 2 - Although both have outer similar electronic configuration as $4s^1$ but Cu has fully filled 3d orbital which is not available in the case of K

a) Both the statements are correct
b) Both the statements are incorrect
c) Statement 1 is correct but statement 2 is incorrect
d) Statement 2 is correct whereas Statement 1 is incorrect
e) None of the above

Q-41.) The value of M is given as unity. Take the value of i as 2 for the given question. Two vectors are represented as :

$X = mi + (M-i)j + (2m-1)k$

$Y = i + 2(m-1)j + (M-i)k$

Z represents the magnitude of (X×Y). When the value of Z is divided by (M/m) {as given in the diagram below} then, the result comes out to be unity.

Find the value of m using the above information.

$$\begin{vmatrix} m & (M - i) & (2m - 1) \\ i & 2(m - 1) & M - i \end{vmatrix}$$

$$\left(\frac{M}{m}\right)$$

Q42.) Read the passage given below and answer the questions that follow.

A group of people went on a safari with a guide. The guide told the tourists that they can take the tour of the whole park along the roads but they must avoid the wild monkeys as they may harm them. He also told them that on every turn, where the roads divide into two/ three directions, there are sign boards placed with some message and exactly one of the signboards contains the wrong message. Tourists need to identify the correct path with the help of the signboards only, which of the following would be a safer route?

i)

ii)

iii)

Three subparts of the question were present with different statements and the answer could be found out by using the simple method of contradiction.

(43 - 49) There are two columns given below. Column-1: contains Persian Words/Statements

Column-2: contains their respective English translations (meaning). Based on the given column

Answer the questions which follow.

Persian	English
Xaridam	→ I Bought
Xaridi	→ You (Singular) Bought
Xarid	→ He Bought
Naxaridam	→ I did not Buy
Namixaridand	→ They were not Buying
Naxaridim	→ We did not Buy
Mixarid	→ (he) Was Buying
Mixaridid	→ You (plural) were Buying

Also, "Xaridan" means "To Buy" and "Chesidan" means "to taste"

Questions:

43. The Suffix in Persian for I is __________.

44. The Suffix in Persian for They is__________.

45. Translate into Persian "You (Plural) were not Buying" __________.

46. Translate into Persian "You (Singular) did not taste" __________.

47. Translate into Persian "You (Plural) were not tasting" __________.

48. Translate into Persian "We were tasting" __________.

49. Translate into Persian "I did not taste" __________.

IIITPREP UGEE 2021 PAPER ANSWER KEY

Answers of UGEE 2021 SUPR

1	C	11	A	21	-	31	B	41	C
2	B	12	A	22	E	32	A	42	A
3	D	13	E	23	D	33	A	43	E
4	E	14	A	24	D, A	34	C	44	A
5	E	15	E	25	A	35	D	45	B
6	-	16	Faulty question	26	B	36	E	46	A
7	C	17	B	27	A	37	A	47	A
8	D	18	A	28	B	38	E	48	A
9	B	19	-	29	E	39	A		
10	A	20	E	30	E	40	B		

Answers of UGEE 2021 REAP

1	1	11	C	21	C	31	E	41	Self
2	4	12	B	22	B	32	B	42	-
3	C	13	SFAWOB	23	B	33	D	43	Am
4	D	14	W & J	24	E	34	E	44	And
5	D	15	Japan	25	B	35	C	45	Namixaridid
6	-	16	-	26	Sol	36	Insufficient data	46	Nachesidi
7	-	17	C	27	A	37	-	47	Namicesidid
8	E	18		28	E	38	C	48	Michesidim
9	A	19	A	29	A	39	B	49	Nachesidam
10	A	20	A	30	A	40	D		

1) Correct Answer → (C) 2

Given: $x = 2$ and $y = mz + c$

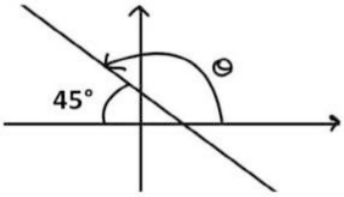
$\therefore\ |2i + (mz + c)j + zk| = 5$

$2^2 + (mz + c)^2 + z^2 = 5^2$

The above quadratic would yield two unique values of "z" and hence "y".

2) Correct Answer → (B) $3\pi/4$

Slope, $m = \frac{2-1}{1-2} = -1$



Inclination $= \theta = \pi - \frac{\pi}{4} = \frac{3\pi}{4}$

3) Correct Answer → (D) 1

$\lim x \to \infty\ \frac{x^2+x-1}{x^2-2x+3}$

On applying L-Hospital Rule,

$\lim\limits_{x\to\infty} \frac{2x+1}{2x-2} = \frac{2x+1}{2(x-1)}$

On dividing by x and enforcing the limit $x \to \infty$,

We get,

$\lim\limits_{x\to\infty} \frac{2+y_x}{2(1-y_x)} = \frac{2}{2} = 1$

4) Correct Answer → (E)

In option (E)

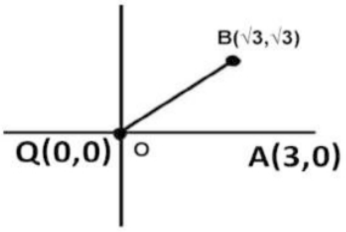
If $n = 3$ then $\mathrm{F}(x) = 0$

And $n \in$ any even number, then also $\mathrm{F}(x) = 0$

Therefore, it is not a one-one function.

{Remove "but an onto function" from the question}

5) Correct Answer → (E) None of the above



$\mathrm{OA} = 3$ $\mathrm{OB} = \sqrt{6}$

$\mathrm{V}_A = \frac{9\times10^9\times10^{-6}}{3} = 3 \times 10^3\ \mathrm{V}$

$\mathrm{V}_\mathrm{B} = \frac{9\times10^9\times10^{-6}}{\sqrt{6}} = \frac{9}{\sqrt{6}} \times 10^3\mathrm{V}$

$\mathrm{V}_A - \mathrm{V}_\mathrm{B} = 10^3\left\{3 - \frac{3\sqrt{6}}{2}\right\}\mathrm{V}$

6) Correct Answer → In UGEE SUPR Guide

Revise Important Section from SUPR also

7) Correct Answer → (B)

Since, Isobaric process implies P = Constant

Given, $\Delta H = Qp = 0$

As, $nC_p\Delta T = 0$

So, $\Delta T = 0$ *and* $\Delta U = 0$ & $\Delta W = p\Delta V$

so, Ans (C)

8) Correct Answer → (D) $+3, 1, 0, +1/2$

If n $= 3$, l can be 0, 1, 2.

If $l = 1$, m can be $-1, 0, 1$.

And s can be either +1/2 or $-1/2$.

9) Correct Answer → (B)

$\mathrm{F}'(x) = 2x$ $0 \le x \le 1$

$\mathrm{F}'(x) = -\frac{1}{x^2}$ $x < 0$

$\mathrm{F}'(x) = 0$ $x > 1$

$\mathrm{F}'(0^+) = 0,$ $\mathrm{F}'(0^-) = -\infty,$

$\mathrm{F}'(0) = 0$

$\mathrm{F}'(1^+) = 0,$ $\mathrm{F}'(1^-) = 2,$

$\mathrm{F}'(1) = 2$

$\therefore$ F(x) is not differentiable at 0 and 1.

10) Correct Answer → (A) m be reduced by 4 times.

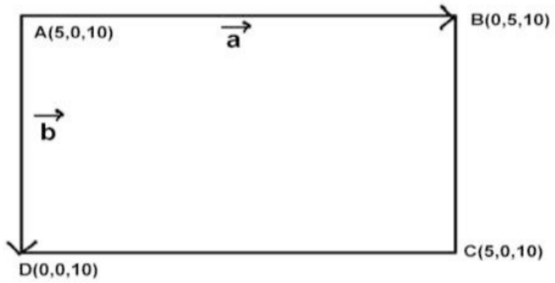
In a harmonic oscillator,

$\delta \propto \frac{1}{\sqrt{m}}$

If F → 2F

Then $m \rightarrow m/4$

11) Correct Answer → (A)



Area = $\vec{a} \times \vec{b} = \left(-5\hat{\imath} + 5\hat{\jmath} + 10\hat{k}\right) \times \left(-5\hat{\imath} + 10\hat{k}\right)$

$$25\begin{vmatrix} \hat{\imath} & \hat{\jmath} & \hat{k} \\ -1 & 1 & 2 \\ -1 & 0 & 2 \end{vmatrix}$$

$= 25 \times \left\{\hat{\imath}(2-0) - \hat{\jmath}(-2+2) + \hat{k}(0+1)\right\}$

$= 50\hat{\imath} + \widehat{25k}$

$\emptyset = \vec{\mathrm{B}}.\vec{\mathrm{A}} = (\hat{\imath} - \hat{\jmath}).\left(50\hat{\imath} + 50\hat{k}\right) = 25$ Wb

12) Correct Answer → (A) 102nm

$\mathrm{T} = 300\mathrm{k}$

$\mathrm{p} = 1.01 \times 10^5\mathrm{Pa}$

$\partial = 0.3nm = 0.3 \times 10^{-9}m$

$\lambda = \frac{1}{\mathrm{M}6^1\sqrt{2}\mathrm{N}^*}, \qquad \mathrm{N}^* = \frac{\mathrm{N}}{\mathrm{V}} = \frac{\mathrm{P}}{\mathrm{KT}}$

$\lambda = \frac{\mathrm{KT}}{\mathrm{M}6^1\sqrt{2}\mathrm{P}} =$

$$\frac{(1.38\times10^{-23})(300)\times10^9}{(3.14)(0.3\times10^{-9})^2(1.414)\left(1.01\times10^5\right)}\ nm$$

$\therefore \lambda = 102\ nm$

13) Correct Answer → (E) 30.5°C

i) $2 \times c \times (80 - \theta) = 8 \times c \times (\theta - 20) \implies \theta_1 = 32$°C

ii) $5 \times c \times (\theta - 32) = 15 \times c \times (36 - \theta) \implies \theta_2 = 35$°C

iii) $5 \times c \times (32 - \theta) = 15 \times c \times (\theta - 24) \implies \theta_3 = 26$°C

iv) $20 \times c \times (35 - \theta) = 20 \times c \times (\theta - 26)$

$\therefore 2\theta = 61$

$\theta = 30.5$°C

14) Correct Answer → (A)

$\Delta\mathrm{G} = \Delta\mathrm{H} - \mathrm{T}\,\Delta\,\mathrm{S}$

For a spontaneous reaction,

$\Delta\mathrm{G} < 0$

$\Delta\mathrm{H} - \mathrm{T}\,\Delta\,\mathrm{S} < 0$

Given: $\Delta\mathrm{H} < 0$ and $\Delta\mathrm{S} < 0$

$\therefore\ \Delta\,\mathrm{H} - \mathrm{T}\Delta\mathrm{S} > 0$

$\Delta\mathrm{H} > \mathrm{T}\,\Delta\,\mathrm{S}$

$\mathrm{T} < \left|\frac{\Delta\mathrm{H}}{\Delta\mathrm{S}}\right|$

It will be spontaneous at low temperature.

15) Correct Answer → (E) $\frac{11}{32}$

The cases can be as follows:

$(\underline{101}00), (\underline{101}11), (\underline{101}01), (\underline{101}10), (0\underline{101}0), (1\underline{101}1), (0\underline{101}1), (1\underline{101}0), (00\underline{101}), (11\underline{101}), (01\underline{101})$

$\mathrm{P} = \left(\frac{1}{2}\right)^5 \times 11 = \frac{11}{32}$

16) Correct Answer → {FAULTY QUESTION}

Revise Complete Graph Question from SUPR Section Book

$x = e^{\theta}\sin(\sin\theta)$

$y = e^{\theta}\cos(\cos\theta)$

$\frac{dx}{d\theta} = e^{\theta}\sin(\sin\theta) + e^{\theta}\cos(\sin\theta)\cos\theta$

$\frac{dy}{d\theta} = e^{\theta}\cos(\cos\theta) + e^{\theta}\sin(\cos\theta)\sin\theta$

$\therefore \frac{dy}{dx} = \frac{\cos(\cos\theta)+\sin(\cos\theta).\sin\theta}{\sin(\sin\theta)+\cos(\sin\theta)\cos\theta}$

$l = \int_0^{N_2}\sqrt{1+\left(\frac{dy}{dx}\right)^2}\,dx$

17) Correct Answer → (B)

Let a point on line be P: (2λ +1, 3λ – 1, 1-2λ)

Let (0,1,2) be A & A_p Perpendicular Line

$\therefore[(2\lambda+1)\,\hat{\imath}+(3\lambda-2)\,\hat{\jmath}+(-2\lambda-1)\,\hat{k}].(2\hat{\imath}+3\hat{\jmath}-2\hat{k})=6$

$\therefore 4\lambda+2+9\lambda-6+4\lambda+2 = 0$ so, $\lambda = 2/17$

$\therefore$ Equation of Line $\Rightarrow \frac{x-0}{-3} = \frac{y-1}{4} = \frac{z-2}{3}$

18) Correct Answer → (A)

$\int y\ dy = \int ax\ dx$

$\frac{y^2}{2} = \frac{ax^2}{2} + c$

$y^2 - ax^2 = c$

This will represent a hyperbola for any positive real value of "a".

19)

20) Correct Answer → (E) None of the above.

STP i.e., the scalar triple product of the three vectors should be zero.

Let the third vector be,

$x\hat{\imath} + y\hat{\jmath} + z\hat{k}$

$$\begin{vmatrix} 4 & -1 & 7 \\ 3 & 2 & 5 \\ x & y & z \end{vmatrix} = 0$$

On putting different values, none of them satisfy. Thus, (E)

21)

22) Correct Answer → (E) $\sqrt{1360}$

$\vec{A} = 8(2\hat{\imath} + 2\hat{\jmath} + \hat{k})$

$\vec{B} = 3\hat{\imath} - 4\hat{\jmath} + 8\hat{k}$

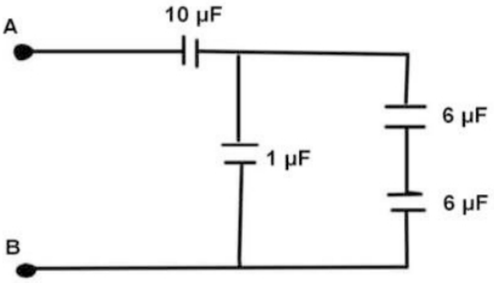
Area $= |\vec{A}\times\vec{B}|$

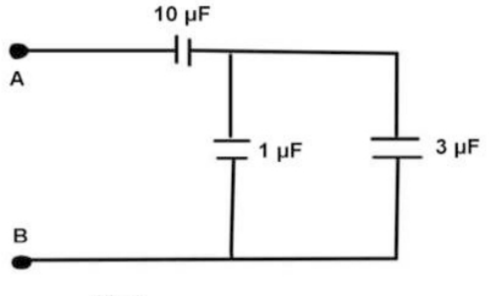
$\therefore$ Area $= \begin{vmatrix} \hat{\imath} & \hat{\jmath} & \hat{k} \\ 16 & 16 & 8 \\ 3 & -4 & 8 \end{vmatrix}$

Area $= \hat{\imath}\,(160) - \hat{\jmath}(104) + \hat{k}(-112) = A$

Required area $= A/6 = \sqrt{1360}$

23) Correct Answer → (D) 20/7





$= Ceg = \frac{10\times 4}{14} = 20/7\mu\text{F}$

24) Correct Answer → i) (D) ii) (A)

Bond order: -

CO(3), CN (2.5), NF (2), NO (2.5), $N_2(3)$

i) After losing an e^-, NO will stabilize as bond order will increase from $2.5 \rightarrow 3$.

ii) After gaining an e^-, CN will stabilize as bond order will increase from $2.5 \rightarrow 3$

25) Correct Answer → (A) 1/4 times

$\lambda = \frac{h}{mv} = \frac{h}{\sqrt{2mKE}}$

$\therefore\ \lambda \propto \frac{1}{\sqrt{KE}}$

KE → 16 KE

$\lambda \rightarrow \lambda/4$

26) Correct Answer → (B) $x + 3y - 7$

$y = 3x - 1,$ Slope = 3

For the given line, let the slope = m

$m.3 = -1$

$\therefore m = \frac{-1}{3}$

$\frac{-1}{3} = \frac{y-2}{x-1}$

$1 - x = 3y - 6$

$x + 3y - 7 = 0$

Is the required equation of the line.

27) Correct Answer → (A) 0

If Rolle's theorem is applicable on $F(x)$ in the interval [0,2], then

$F(0) = F(2)$

$C.2^{2/3} = 0$

$\therefore C = 0$

28) Correct Answer → (B) $n/4$

$\mathrm{I} = \int_0^{n/2} \frac{\sqrt{\sin x}}{\sqrt{\sin x} + \sqrt{\cos x}}\,dx$ -------------- (i)

$\mathrm{I} = \int_0^{n/2} \frac{\sqrt{\cos x}}{\sqrt{\sin x} + \sqrt{\cos x}}\,dx$ --------------(ii)

$\{\int_0^a \delta(x)\,dx = \int_0^a \delta(a-x)dx$

On adding (i) and (ii),

$2\mathrm{I} = \int_0^{n/2} \frac{\sqrt{\sin x} + \sqrt{\cos x}}{\sqrt{\sin x} + \sqrt{\cos x}}\,dx = \int_0^{n/2} dx$

$2\mathrm{I} = \frac{n}{2}$

$\therefore \mathrm{I} = n/4$

29) Correct Answer → (E) None of the above.

$\mathrm{I} = \int_0^1 \frac{x}{x^2+4x+3}dx = \int_0^1 \frac{x}{x^2+3x+x+3}dx$

$\mathrm{I} = \int_0^1 \frac{x+1-1}{(x+1)(x+3)} = \int_0^1 \frac{dx}{x+3} - \int_0^1 \frac{dx}{(x+1)(x+3)}$

$\mathrm{I} = \int_0^1 \frac{dx}{x+3} - \frac{1}{2} \int_0^1 \frac{(x+3)-(x+1)}{(x+1)(x+3)}dx$

$\mathrm{I} = \int_0^1 \frac{dx}{x+3} - \frac{1}{2}\int_0^1 \frac{dx}{x+1} + \frac{1}{2}\int_0^1 \frac{dx}{x+3}$

$\mathrm{I} = \frac{3}{2}\int_0^1 \frac{dx}{x+3} - \frac{1}{2}\int_0^1 \frac{dx}{x+1}$

$\mathrm{I} = \frac{3}{2}\ln|x+3|\Big|_0^1 - \frac{1}{2}\ln|x+1|\Big|_0^1$

$\mathrm{I} = \frac{3}{2}\{\ln 4 - \ln 3\} - \frac{1}{2}\ln\{2\}$

$\mathrm{I} = \frac{3}{2}.2.\ln 2 - \frac{3}{2}\ln 3 - \frac{1}{2}\ln 2$

$\mathrm{I} = \frac{5}{2}\ln 2 - \frac{3}{2}\ln 3$

30) Correct Answer → (E) 2400 J

$\eta = 1 - \frac{T_2}{T_1} = \frac{\text{output}}{\text{input}}$

$\eta = 1 - \frac{400}{800} = \frac{1}{2}$

$\therefore$ Input $= 2 \times 1200 = 2400$ J

31) Correct Answer → (B) 1

$\lim_{x\to\infty} \frac{x^2-2x+x-2}{x^2-2x-2x+4} = \frac{x(x-2)+1(x-2)}{x(x-2)-2(x-2)}$

$\lim_{x\to\infty} \frac{(x+1)(x-2)}{(x-2)(x-2)} = \frac{x+1}{x-2}$

$\lim_{x\to\infty} \frac{1+\frac{1}{x}}{1-\frac{2}{x}} = 1$

32) Correct Answer → (A)

$mc(T_F - T_1) = mc(T_2 - T_F)$

$2T_F = T_1 + T_2$

$\therefore\ T_F = \frac{T_1+T_2}{2}$

Where "T_F" is the final temperature attained.

$\Delta S = Cp\ln\left(\frac{T_F}{T_1}\right) + cp\ln\left(\frac{T_F}{T_2}\right)$

$\Delta S = Cp\ln\left(\frac{{T_F}^2}{T_1T_2}\right) = Cp\ln\left\{\frac{(T_1+T_2)^2}{4\,T_1T_2}\right\}$

33) Correct Answer → (A) a

$x^{2/3} + y^{2/3} = a^{2/3}$

The length of the tangent intercepted between the co-ordinate axes is "a".

{Standard result}

34) Correct Answer → (C) 1

$$A^2 = \begin{bmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ 3 & 2 & 1 \end{bmatrix}\begin{bmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ 3 & 2 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 4 & 1 & 0 \\ 10 & 4 & 1 \end{bmatrix}$$

$$A^2 + I = \begin{bmatrix} 2 & 0 & 0 \\ 4 & 2 & 0 \\ 10 & 4 & 2 \end{bmatrix}, A + I = \begin{bmatrix} 2 & 0 & 0 \\ 2 & 2 & 0 \\ 3 & 2 & 2 \end{bmatrix}$$

$$(A + I)^{-1} = \frac{1}{8}\begin{bmatrix} 4 & 0 & 0 \\ 4 & 4 & 0 \\ -2 & -4 & 4 \end{bmatrix}\begin{bmatrix} \frac{1}{2} & 0 & 0 \\ \frac{1}{2} & \frac{1}{2} & 0 \\ -\frac{1}{4} & -\frac{1}{2} & \frac{1}{2} \end{bmatrix}$$

$(A^2 + I).(A + I)^{-1} =$

$$\begin{vmatrix} 2 & 0 & 0 \\ 4 & 2 & 0 \\ 10 & 4 & 2 \end{vmatrix}\begin{bmatrix} \frac{1}{2} & 0 & 0 \\ \frac{1}{2} & \frac{1}{2} & 0 \\ \frac{1}{4} & -\frac{1}{2} & \frac{1}{2} \end{bmatrix}$$

B

$$B = \begin{bmatrix} 1 & 0 & 0 \\ 3 & 1 & 0 \\ 13/2 & 1 & 1 \end{bmatrix}, \quad |B| = 1$$

35) Correct Answer → (D)

$Na_2B_4O_7.10H_2O \xrightarrow{HCl} H_2B_4O_7 \xrightarrow{H_2O} H_3BO_3 \xrightarrow{\Delta} B_2O_3$

NCERT Based (p-block)

36) Correct Answer → (E) e^{a+b}

$\lim_{x\to 0}\left(\frac{1+ax}{1-bx}\right)^{\frac{1}{x}}$

It is of the format 1^{∞}. (Standard case). The answer would be e^k, where

$\lim_{x\to 0} k = \left\{\frac{1+ax}{1-bx} - 1\right\}\frac{1}{x}$

$\lim_{x\to 0}\left(\frac{x+ax-1+bx}{1-bx}\right)\frac{1}{x} = a + b$

$\therefore$ Limit $= e^{a+b}$

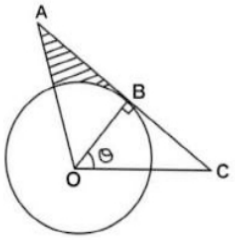
37) Correct Answer → (A)

Number of electrons: $N_2^-(15)$ & $N_2^+(13)$

Bond order: $N_2^-(2.5)$ & $N_2^+(2.5)$

Thus, Both the species have the same bond order.

38) Correct Answer → (E) None of the above



Due to symmetry $\theta = 45°$

So, $OB = 1 \Rightarrow BC = 1$ and $AB = 1$

$OC^2 = OB^2 + BC^2$

$OC = \sqrt{2}\ cm$

Let Area of shaded region be, A:

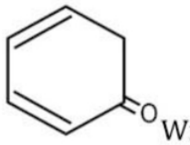
$A + \frac{\pi}{4} + A = 1$

$2A = 1 - \frac{\pi}{4}$ $\therefore A = \frac{1}{2} - \pi/8\ cm^2$

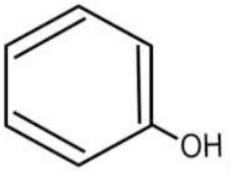
39) Correct Answer → (A) ∝

Propane will get attached to the ortho position of the benzene ring because of the + I effect exhibited by the group attached b/w the two benzene rings.

40) Correct Answer → (B)



Will have the maximum enol content as the enol form of it, that is



has aromatic character.

41) Correct Answer → (C)

$$x^{n+1} = 1$$

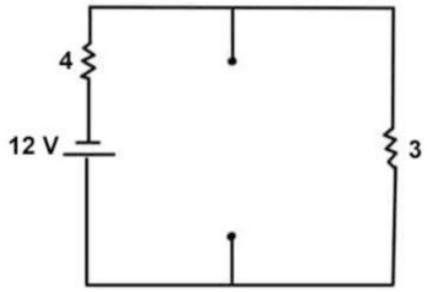
$$(x-1)(1 + x + x^2 + x^3 + \cdots + x^n)$$

$$\downarrow$$

This derived polynomial will have all the $(n+1)$ roots of unity except 1.

42) Correct Answer → (A) 12/7

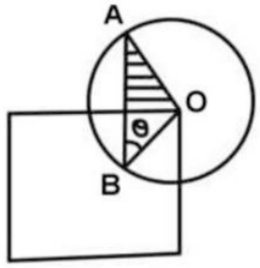
The middle diode would be reverse-biased whereas the right most diode is forward biased.



$\therefore\ \dot{2} = \frac{12}{(4+3)} = 12/7$ A

43) Correct Answer → (E) None of the above

Revise From UGEE SUPR & REAP Guide



Taking angle B as 15°

$\therefore\ \angle AOB = 180° - 30° = 150°$

Area of $\Delta AOB = \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{16}\ cm^2$

Required area = $\frac{1}{8}\ cm^2$

44) Correct Answer → (A) 2/3

Suppose the balls were previously arranged in a specific manner.

Now, for any such case, the second person has to place the balls in such a way such that the numbering does not coincide.

For the 1st ball → It would have 2 choices of position.

For the 2nd ball → It will also have 2 choices

However, as the 1st and 2nd balls get their specific positions the place of 3rd ball gets already fixed, so it has only one choice.

Now,

Favorable cases = $2 * 2 * 1 = 4$

Total cases = $3! = 6$

Probability = $\frac{4}{6} = 2/3$

45) Correct Answer → (B) $\frac{8}{2187}$

Each ant can move along 3 possible edges.

Total paths = $3^8 = 6561$

Number of paths at which ants do not collide,

CASE 1: The ants on opposite faces rotate positions.

For each face, the ants can move in 2 directions (clockwise and counter-clockwise).

Thus, there are $2 \times 2 = 4$ possibilities for each pair of opposite faces.

There are 3 pairs of opposite faces:

Thus, in $4 \times 3 = 12$ ways the ants do not collide.

CASE 2: All 8 ants move in a loop.

A closed path that goes through every vertex exactly once is called a Hamiltonian cycle.

There are 6 undirected Hamiltonian cycles.

Each loop can be traversed in 2 directions, so, $6 \times 2 = 12$ ways.

Thus, $P = \frac{12+12}{6561} = \frac{24}{6561} = \frac{8}{2187}$

46) Correct Answer → (A)

$\Delta H° = -x$ and $\Delta S° = -x + 72$

$\Delta G° = -x - T(-x + 72) < 0$

$\therefore x + T(72 - x) > 0$

$(72 - x)T > -x$

$(x - 72)T < x$

$T < x/(x - 72)$ {low temperature}

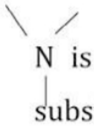
47) Correct Answer → (A) 2000 J

$H = \dot{2}^2 Rt$

$\therefore R = \frac{500}{\frac{3}{2}\times\frac{3}{2}\times 20} = \frac{100}{9} r$

Now, $H' = 3 \times 3 \times \frac{100}{9} \times 20 = 2000$ J

48) Correct Answer → (A)



N is an activating group therefore substitution will take place at para position with

respect to it.

REAP

(1-2) $\propto = 1$ and $\beta = 4$

1) Answers → i) $\propto = 1$

ii) $\beta = 4$

Profit = $7\propto + 4\beta$

Constraints:

$$3\propto + 2\beta \le 12$$

$$3\propto + \beta \le 8$$

On plotting,

Corner points: $(0,6), \left(\frac{8}{3}, 0\right), (0,0), \left(\frac{4}{3}, 4\right)$

Profit is maximum in the case of $\left(\frac{4}{3}, 4\right)$.

$\therefore \propto = 1$ and $\beta = 4$

3) Correct answer -> C 25

Profit = $110x - x^3 - 60x = 50x - x^2 = y$

For Profit to be maximum, $\frac{dy}{dx} = 0$

$50 - 2x = 0 \quad \therefore x = 25$

4) Correct Answer → D

i) Let, Robin Hood be in Mr. Red's House, then:

Statement of: Mr. Red ✓

Mrs. Green ✓

Mr. White ×

In this case, Mr. white should not lie but he is lying. So, Robin Hood cannot be in Mr. Red's House.

ii) Let, Robin Hood be in Mrs. Green's House, then:

Statement of: Mr. Red ×

Mrs. Green ×

Mr. White ✓

In this case, Mr. White should also lie but he is not. So, Robin Hood cannot be in Mrs. Green's House.

iii) Let, Robin Hood be in Mr. White's House, then:

Statement of: Mr. Red ×

Mrs. Green ✓

Mr. White ✓

If Mr. Red is lying then Mrs. Green should also lie but this is not the case. So, Robin Hood cannot be in Mr. White's House.

Thus, Robin Hood is not in the neighborhood.

5) Correct Answer → (D) 2.5 lakh

A	B
$r = 12\%$	8%
$p = 2x$	$25{,}00{,}000 - x$

Interest he has to pay to bank is,

$$I_1 = \frac{500000 \times 5 \times 1}{100} = \text{Rs. } 25000$$

Total interest that he can earn from A & B is,

$$I_2 = \frac{x \times 12 \times 1}{100} + \frac{(500000 - x)8}{100}$$

$$\therefore I_2 = \frac{4x + 4000000}{100}$$

Now, profit = $I_2 - I_1 = 25000$

So, $\frac{4x + 4000000}{100} = 50000$

$4x = 5000000 - 4000000 = 1000000$

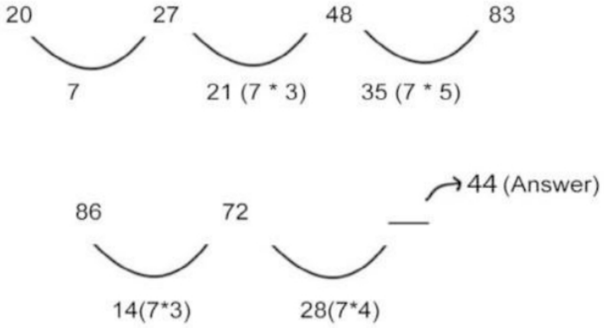
$x = \text{Rs. } 2.5$ laks.

6) Revise Miscellaneous Problem from IIITprep UGEE REAP Guide

7)

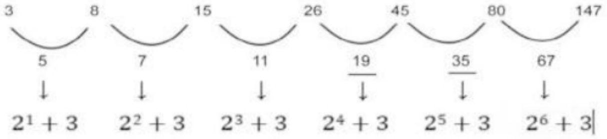
8) Correct Answer → (E) 44

The Pattern followed is:


20
27
48
83
7
21 (7 * 3)
35 (7 * 5)
86
72
44 (Answer)
14(7*3)
28(7*4)

9) Correct Answer → (A) 45

The pattern followed here is:


3
8
15
26
45
80
147
5
7
11
19
35
67
$2^1 + 3$
$2^2 + 3$
$2^3 + 3$
$2^4 + 3$
$2^5 + 3$
$2^6 + 3$

10) Correct Answer → (A)

Friend in "B" → Electronics

Friend in "A" → Mechanical

Friend in "C" → Computer Science

Biju cannot study in "B" and he is not doing Mechanical Engineering, that is Biju is not in "A" as well, so Biju is in "C" doing computer science Engineering.

Ari cannot study in "A" and Biju is studying in "C", so Ari has to be in "B" doing Electronics.

Thus, Charu is in "A" and she is doing Mechanical Engineering.

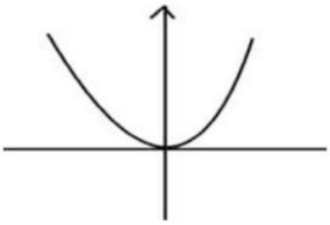
11) Correct Answer → (C) 10^{17}

$T = 1.5 \times 10^{-16} \frac{n^3}{z^2} \propto$

$F = \frac{1}{T} \approx 10^{17}$

12) Correct Answer → (B) $y = x^2$

$y = x^2$ is not a one-one function



however, it is an onto function for the range of natural numbers.

(13-15)

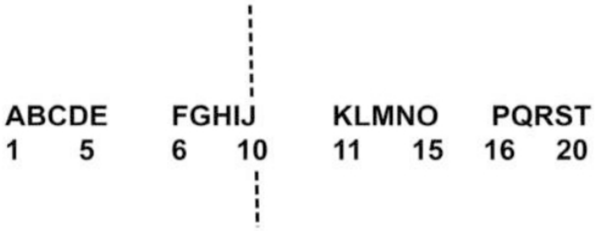
Before Starting Revise Complete Coding & Decoding Chapter from **UGEE REAP Guide**

Answers → i) SFAWOB

ii) W & J

iii) Japan

Using symmetry, (About J)

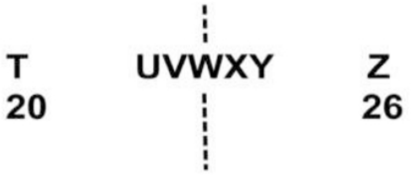

ABCDE
FGHIJ
KLMNO
PQRST
1
5
6
10
11
15
16
20

1 → 19 that is A → S

Similarly, N → F

S → A and so on.

On similar notes using symmetry, (About W)


T
UVWXY
Z
20
26

So, $T \rightarrow Z$

$W \rightarrow W$

$U \rightarrow Y$ and so on.

Thus, the letters J and W would stand the same position.

16) Revise Important SET II from UGEE SUPR Guide

17) Correct Answer → (C)

$(3,15,36)$

If $m = +\frac{1}{2}, -\frac{1}{2}$ and 0 then maximum three electrons can be occupied in a given atomic orbital.

Now, Groups in s-block = 3.

Groups in p-block = 9

Groups in D-block = 15

Groups in F-block = 21

Therefore, the atomic numbers would be: 3, 15, 36.

18) Graphical Analysis Question

19) Correct Answer → (A)

2

$$13.6\ \frac{(2)^2}{n^2} = 13.6\ \frac{(1)^2}{12}$$

$n = 2$

20) Correct Answer → (A)

Rate of any chemical reaction depends upon the rate determining step that is the slowest step of the reaction.

$r = k_2[N_2O_2][H_2]$

$k_1 = \frac{[N_2O_2]}{[NO]^2}$

$[N_2O_2] = k_1[NO]^2$

$\therefore r = k_1k_2[NO]^2[H_2]$

Thus, rate of reaction is proportional to $k_1[NO]^2$.

21) Correct Answer → (C)

In case of metals, the atoms are very closely packed which leads to very high magnitude of inter-atomic forces which in turn stabilizes the metals.

Thus, things made by metals are stronger than rocks.

22) Correct Answer → (B)

“m” students take up “n” courses.

Pij → order (m × n)

Order of P is $(m \times n)$ and order of PT will be $(n \times m)$.

So, order of $(P^T \times P)$ will be $(n \times m) \times (m \times n)$ that is $(n \times n)$.

Where, “n” is the number of courses.

Since, it has the order $(n \times n)$.

Therefore, K = L

So, option (B) is most appropriate answer however option (E) can also be considered.

23) Correct Answer → (B)

Option (B) should be modified as A – captain, B – All-rounder, C – Wicket Keeper.

Going via the process of contradiction, consider option (B).

If A is the captain, then A’s statement is correct.

If B is the all-rounder, then B’s statement is incorrect.

If C is the wicket-keeper, then C's statement is incorrect.

Thus, the condition that only one of the given statements is correct is fulfilled. Hence,
A → Captain, B → All rounder, C → Wicket keeper

24) Correct Answer → (E) None of the above

$p(x > 1) = 1 - p(x = 0) - p(x = 1)$

$p(x = 0) = e^{-\propto}.\frac{\propto^0}{0!} = e^{-\propto}$

$p(x = 1) = e^{-\propto}.\frac{\propto^1}{1!} = \propto e^{-\propto}$

$p(x > 1) = 1 - e^{-\propto} - e^{-\propto}.\propto$

$p(x > 1) = 1 - e^{-\propto}(1 - \propto)$

25) Correct Answer → (B) 5.48

$\mathrm{kin} = 3 \times 10^{-5}$

$\mathrm{p^{kin}} = 5 - \log 3 = 4.53$

$\mathrm{HIn} \rightleftharpoons \mathrm{H^+} + \mathrm{In^-}$

$0.1x \qquad 0.9x$

$p^{\mathrm{H}} = p^{\mathrm{kin}} + \log\left[\frac{(\mathrm{In^-})}{(\mathrm{HIn})}\right]$

$p^{\mathrm{H}} = 4.53 + \log 9 = 5.48$

$p^{\mathrm{H}} = 5.48$

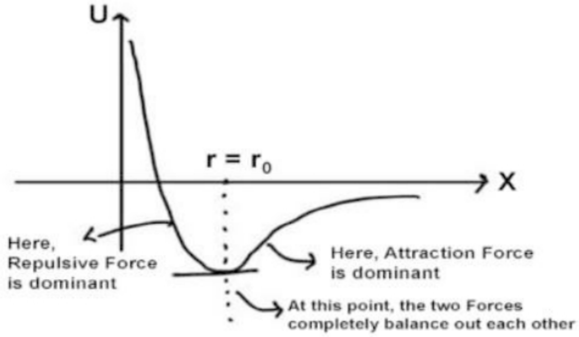
26) Revise **Important** Section from **IIITprep UGEE SUPR Guide**

27) Correct answer →

27) (A) $m = n$

28) (E) none of the above

The potential well diagram is as follows:



Therefore, $m = n$
Irrespective of the charge possessed by the atoms, the above phenomenon does take place.

29) Correct Answer → (A) Minimum
The equilibrium position at the internuclear distance is "stable" in nature. Thus, the potential energy would be minimum.
(It can be interpreted from the energy diagram/potential well diagram as well)

30) Correct Answer → (A) Between it ends.
The strongest magnetic field is produced at the poles of the horse-shoe magnet.
(NCERT Based)

31) Correct Answer → (E) Lift Force
The reason behind the tilt of the wings in an aero plane is to counter balance the pressure difference (given by Bernoulli's principle).

Thus, lift force is the reason behind this tilt in the wings of the Aeroplan.
*{In the exam, lift force was present in one of the options}

32) Correct answer → (B)

In the best suitable arrangement,

None of the holes can have more than 4 pigeons because ($5 \times 4 = 20$ and $20 > 17$ pigeons).

However, each hole should have at least 3, 2 pigeons ($5 \times 3 = 15$ and $15 < 17$ pigeons).

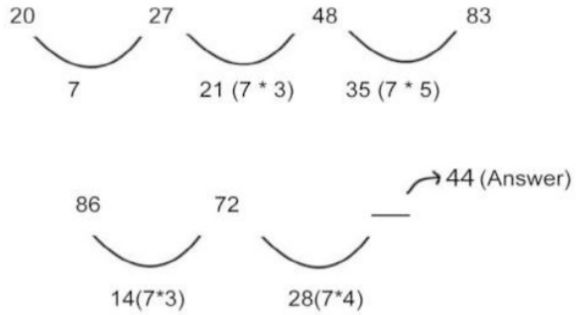
So, the best arrangement (symmetrical) falls out as:

$(3,3,3,4,4)$ ← This distribution

Thus, option (B) suits the best.

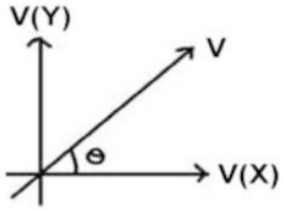
33) Correct Answer → (D) 44

The pattern followed is Difference Pattern:



34) Correct Answer → (E) (A & B)

Let initial velocity be "v",



$v(x) = v\cos\theta$

$v(y) = u\sin\theta - \text{gt}$

Correct graphs include: → (A & B)

35) Correct Answer → (C)

The most certain and logical conclusion would be,

Derive a mathematical equation on the number of flies coming out of the cow dung.

36) Insufficient data

37) Question needs to be modified.

38) Correct Answer → (C)

The net force on the balloon is in the upward direction as Buoyant Force is greater than that of its weight, so it moves in the upward direction.

However, in the case of the ball, as the net force is in the downward direction, it goes downward.

39) Correct Answer → (B)

The body is built in such a way that the growth hormones tend to decrease chemically over a specific period of time.

40) Correct Answer → (D)

Across the period, the effective nuclear charge increases and the overall size of the atom decreases. So, size of Cu $<$ size of k. So, statement 1 is incorrect however statement is correct.

(NCERT Based)

41) Correct Answer →

$m = 1$

$i = 2$

$$\begin{vmatrix} \hat{\imath} & \hat{\jmath} & \hat{k} \\ m & -1 & 2m-1 \\ 2 & 2(m-1) & -1 \end{vmatrix}$$

$\hat{\imath}\big(1-(2m-2)(2m-1)\big)+\hat{\jmath}\big(m+2(2m-1)\big)+\hat{k}(2m(m-1)+2)$

$= (-4m^2+6m-1)\hat{\imath}+(5m-2)\hat{\jmath}+(2m^2-2m+2)\hat{k}$

Now,

$(6m-4m^2-1)^2+(5m-2)^2+(2m^2-2m+2)^2=\frac{1}{m^2}$

For m, Hit & Trial first for good values if you can point out root else go with Lengthy calculation ....

42) Inadequate, For your knowledge about exam

(43-49)

Revise Complete Linguistics Section from UGEE REAP Guide Books

Answers:

i) Am
ii) And
iii) Namixaridid
iv) Nachesidi
v) Namichesidid
vi) Michesidim
vii) Nachesidam

Solution:

Here “xarid” and “cheshid” are the root words.

Now,

i) Xaridam → "xarid" + "am", so the suffix for "I" is “am”.

ii) Naxaridam → "na" + "xarid" + "am", so “na” implies not. nomixaridand → "na" + "mi" + "xarid" + "and", so “and” is the suffix for “they”.

iii) mixaridid → you (plural) were buying, “mi” + “xarid” + “id”. So, “you (plural) were not buying”, would correspond to “na” + “mi” + “xarid” + “id” that is “namixaridid”.

iv) Similarly, “na” + “cheshid” + “i” that is “nacheshidi” would correspond to “you (singular) did not taste”

v) “na” + “mi” + “cheshid” + “id” = “namicheshidid” would be “you (plural) were not tasting”.

vi) “we were tasting” on similar notes would translate to “mi” + “cheshid” + “im” = “ micheshidim”

“na” + “cheshid” + “am” → “nacheshidam”

THE PAIN YOU FEEL TODAY IS THE STRENGTH YOU WILL FEEL TOMORROW.
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UGEE 2022 MEMORY BASED PAPER

IIITPREP PUBLICATION

UGEE 2022 Paper Pattern

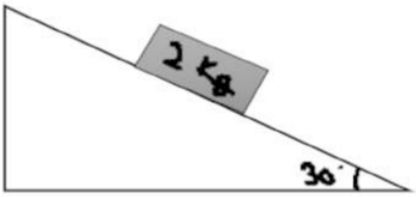
PAPER	No. of Que	Time	Marking	Total Marks	Negative Marking
UGEE 2022	100	3 hr		150	
SUPR	50	1 hr	+1	50	-0
REAP	50	2 hr	+2	100	-0.5

TIME : 3 HRS *TOTAL MARKS : 150*

1. If an object is kept at a distance of 10cm from a concave mirror, find the focal length, given that the image is formed at a distance of 5 cm from the mirror.
   a. 20cm
   b. 5cm
   c. 10cm
   d. 15cm

2. Two trains each of length 40m are travelling towards each other with speeds 10m/s and 15m/s respectively. Find the time taken for them to cross each other.
   a. 2.6 s
   b. 3.6 s
   c. 4.8 s
   d. 1.8 s

3. A block of mass 2 kg is kept on a fixed rough wedge as given in the figure.



Find the frictional force acting on the block?

   a. 15N
   b. 10N
   c. $10\sqrt{3}$N
   d. None of these

4. Find the total number of isomers of the complex compound [Ma_4b_2] where M is the metal and a and b are ligands.
   a. 4
   b. 2
   c. 3
   d. 16

5. Find $\int \frac{1}{2a}\left(\frac{a+x}{a-x}\right) dx$.
   a. $-\frac{x}{2a} - 2\ln\sqrt{\frac{a-x}{2a}} + c$
   b. $\frac{x}{2a} - 2\ln\sqrt{\frac{a-x}{2a}} + c$
   c. $-\frac{x}{2a} + 2\ln\sqrt{\frac{a-x}{2a}} + c$
   d. $\frac{x}{2a} + 2\ln\sqrt{\frac{a-x}{2a}} + c$

6. In two thermodynamic processes (at same initial pressure), adiabatic and isothermal, the pressure is halved in each, resulting in expansion of the gases. The final volumes of isothermal and adiabatic processes are respectively V_{iso} and V_{adi}. Find $\frac{V\ (adi)}{V\ (iso)}$. Given both the gases are at same temperature initially and both are monoatomic.
   a. $\frac{1}{4^{1/3}}$
   b. $\frac{1}{2^{1/3}}$
   c. $\frac{1}{4^{1/5}}$
   d. $\frac{1}{2^{1/5}}$

7. Find ebullioscopic constant K_b of a non-ionizable substance, if, given that the elevation in boiling point is 0.1 K when the molality of the solution is 0.51.
   a. 0.182

b. 0.196
c. 0.167
d. 1.55

8. The composition(by mass) of a compound is

Element	C	H	O
Percentage (%)	40	6.7	53.3

Find the possible formula of the compound.
a. $C_{12}H_{24}O_{13}$
b. $C_{10}H_{22}O_{11}$
c. $C_{10}H_{21}O_{10}$
d. $C_6H_{12}O_6$

9. Find the value of $\sum_{n=1}^{24} k^2$
a. 4812
b. 4900
c. 5112
d. 5670

10. Find the value of $\lim_{x\to a}\left(\frac{x^n-a^n}{x-a}\right)$
a. 1
b. na^n
c. na^{n-1}
d. n

11. If A is a 2x2 matric such that A = $\begin{bmatrix} cos\emptyset & sin\emptyset \\ -sin\emptyset & cos\emptyset \end{bmatrix}$, find the value of $|A^n|$.
a. 0
b. -1
c. 1
d. 2

12. If $\frac{d^2y}{dx^2} = -\sin\left(\frac{dy}{dx}\right)$, find the order and degree of this differential.
a. 2,1
b. 2,2
c. 1,2
d. 1,1

13. Find $\int \frac{1}{x^2+a^2}dx$
a. $\frac{1}{2a}\ln\left|\frac{x-a}{x+a}\right|$ + c
b. $\frac{1}{2a}\ln\left|\frac{x+a}{x-a}\right|$ + c
c. $\frac{1}{a}\tan^{-1}\frac{x}{a}$ + c
d. None of these

14. Which one of the following is optically active?
a. 2,3-dimethylbutane
b. 2-methylpentane
c. 2,3,4-trimethylpentane
d. 2,3-dimethylpentane

15. Given that mean of some observations is 10 and mean of their squares in 110, find the variance of these observations.
a. $\sqrt{10}$
b. 10
c. $\sqrt{11}$
d. 11

16. Find $\int \frac{1}{x^2-a^2}dx$
a. $\frac{1}{a}\tan^{-1}\frac{x}{a}$ + c
b. $\frac{1}{2a}\ln\left|\frac{x+a}{x-a}\right|$ + c
c. $\frac{1}{2a}\ln\left|\frac{x-a}{x+a}\right|$ + c
d. (x-a) + c

17. A body of radius R is rolling with radius of gyration K. Find the ratio of rotational and kinetic energy.
a. ${K^2}/{R^2}$
b. ${(K^2+R^2)}/{R^2}$
c. ${R^2}/{K^2}$
d. ${K^2}/{(K^2+R^2)}$

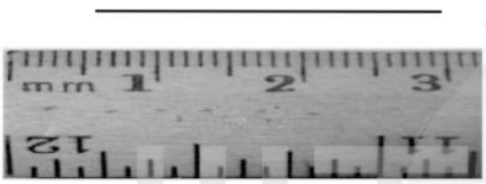
18. Given that $|\overline{a}|$=1 , $|\overline{b}|$=1 and $|\overline{a}+\overline{b}|$=1, find the value of $|\overline{a}-\overline{b}|$.
a. 0
b. 1
c. 2
d. $\sqrt{3}$

19. How many of the following out of NH, OF, CN, NO, N_2 become stable on gaining or losing an electron?
a. 2
b. 3
c. 4
d. 1

20. When two capacitors of equal capacitance are connected in series, their equivalent capacitance is-
    a. Harmonic mean of their capacitances
    b. Sum of capacitances
    c. Geometric mean of capacitances
    d. None of these

21. Find the value of $\sin^{-1}\frac{2x}{1+x^2} + \cos^{-1}\frac{1-x^2}{1+x^2}$ for x $\in (1, \infty)$
    a. 0
    b. π
    c. $4\tan^{-1} x$
    d. None of these

22. For the following, the most appropriate length can be given as



    a. 2.4 mm
    b. 2.5 mm
    c. 2.43 mm
    d. None of these

23. For Z= 3x+4y such that x and y are subjected to following conditions
    x+y ≤ 60 x+y ≥ 120
    x≥ 0 y≥ 0
    there are:
    a. Infinite solutions
    b. One unique solution
    c. Finite but more than one solution
    d. No solution

24. Two equal and opposite forces act on an object, which is in a rotational motion , which if the following cannot be the distance between their point of application?
    A) 0
    B) 5.67
    C) 8.92
    D) 1.25
    E) 0.4

25. If the amplitude of electric field of an electromagnetic wave is 2700 V/m. Find the amplitude of magnetic field component of the electromagnetic field.
    a. 0.003 mT
    b. 0.006 mT
    c. 0.009 mT
    d. None of these

26. If K_b = 0.51 and 10g of a substance is added to 1 litre of water. The boiling temperature was 100.1°C. what is the molecular weight of the substance? (Boiling point of water= 100°C)
    a. 0.051
    b. 0.51
    c. 5.1
    d. 510
    e. 5100

27. If a bag contains 4 white and 4 black, what is the probability that when 2 balls (without replacement) are chosen both of them are white?
    a. ½
    b. 3/7
    c. 3/14
    d. 2/21

28. If a bag contains equal objects A and B. The probability of having faulty A is 1/10 and probability of having faulty B is 1/20. Then what is the probability the chosen item is faulty A?
    a. 1/10
    b. 1/20
    c. 1/15
    d. None of these

29. What is the angle between the planes 2x+3y+2z=5 and 6x+2y+2z=2?
    a. $\cos^{-1} 12/\sqrt{287}$
    b. $\cos^{-1} 11\sqrt{187}$
    c. $\cos^{-1} 11/\sqrt{748}$
    d. None of these

30. If the adjacent sides of a parallelogram are given by $\bar{a} = 4\mathrm{i} + 4\mathrm{j} + 4\mathrm{k}$ and $\bar{b} = \mathrm{i} + \mathrm{j}$ then find the area of the parallelogram.

a. 4
b. 2
c. 8
d. $4\sqrt{2}$

31. If a copper wire of radius 'r' is wound carrying current I, has magnetic moment M_1. The wire is then wound 4 times and carries current I/2 having magnetic moment M_2. Find M_2/M_1.
a. 4
b. ¼
c. 8
d. 1/8

32. Given that $|\overline{a}|$=4 , $|\overline{b}|$=7 and $|\overline{a}+\overline{b}|$=9, find the value of $|\overline{a}-\overline{b}|$.
a. 5
b. 6
c. 7
d. 8

33. If two springs of K_1=20 N/m and K_2=30 N/m are attached end-to-end and connected to a mass. A force F is applied on the mass and the compression in the resulting spring is 10cm, find F.
a. 12N
b. 3.6N
c. 1.2N
d. 36N

34. $ax^2+bx+c = 0$ has roots p and q. What equation will have roots as 1+p/q and 1+q/p.
a. $abx^2+c = 0$
b. $acx^2 + bcx + ab = 0$
c. $acx^2 + b^2(1-x) = 0$
d. none of these

35. An object is dipped in 3 different beakers containing different liquids A, B, C of different densities and it is observed that its $\frac{1}{3}rd, \frac{2}{3}rd\ \ and\ \ \frac{3}{7}$th part is submerged, respectively. Then the increasing order of density of three liquids A, B, C is-
a. $d_B < d_A < d_C$
b. $d_C < d_A < d_B$
c. $d_C < d_B < d_A$
d. $d_B < d_C < d_A$

36. what are possible ways of checking cardinality of two sets A and B are equal or not ?
A) Manually count the elements
B) find bijection in it
C) None of these
D) all of these

37. Find pH of solution made by adding 10^{-8} M HCl in 1 Lit. of water.
a. 4.33
b. 8
c. 6.9
d. None of these

38. If $2\tan^{-1}(cosx) = \tan^{-1}(cosecx)$ then sinx + cosx = ?
a. $2\sqrt{2}$
b. $\sqrt{2}$
c. $\frac{3}{\sqrt{5}}$
d. $\frac{1}{2}$

39. What will be the change in time period of a mass connected to a suspended spring of natural length l which is extended by a distance b ?
a. $2\pi\sqrt{\frac{l}{g}}$
b. $2\pi\sqrt{\frac{b}{g}}$
c. $2\pi\sqrt{\frac{l+b}{g}}$
d. $2\pi\sqrt{g/l}$

40. What is the value of determinant of

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 \end{bmatrix}$$

a. 1
b. -1
c. 0
d. None

41. Light coming from a train appears to come in a straight line, them why is it an EM wave?

a. It is perpendicular to electric field and magnetic field
b. It goes up and down
c. It makes the dust particle oscillate.
d. None of these

42. In maxwells equation curve of KTG, which one of the following is false?
    a. As temperature increases, the mean position is shifted to the right
    b. Molecules of probable speed decreases as temperature is increased
    c. Area under the curve remains same as temperature changes
    d. Area under the curve gives the number of molecules

43. $A_{(liq)} \rightleftharpoons A_{(gas)}$ is an endothermic process. If temperature is increased,
    a. Pressure will increase
    b. Pressure will decrease
    c. Pressure will remain same
    d. Can't say

44. Set A contains 3 elements and set B contains 5 elements. Find the probability that the function A⟶B is one-one.
    a. 0.48
    b. 0.5
    c. 0.6
    d. 0.15
    e. None

45. And octahedral void is made up of two types of atoms having radius R_x=1pm and R_y. What is the smallest value of R_y to keep the void octahedral?
    a. 0.155
    b. 0.225
    c. 0.414
    d. 0.732

46. pK_a of acetic acid and pK_b of ammonium hydroxide is 4.76 and 4.75 respectively. Find the pH of 0.1M ammonium acetate solution.
    a. 7.05
    b. 7.005
    c. 6.995
    d. 6.95

47. During crystallization what happens?
    a. It is a spontaneous process.
    b. It is a non-spontaneous process.
    c. Entropy decreases
    d. <Missing Option>
    e. <Missing Option>

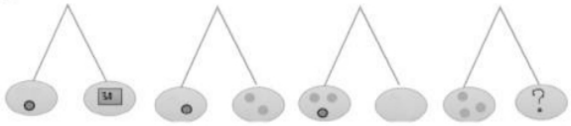
Note: We reconstruct Memory based paper so, In 2022 We were able to recollect 47 out of 50 questions. Few questions or options may have some ambuguity.

REAP Section

1. There are two dice. Find the probability the the sum on them is atleast 9 given that a fixed die among them shows 5.
    a. ½
    b. 1/3
    c. 1
    d. 2/5

2. Find the missing term in the following series: 10, 4, 7, __, 8, 15, 32, 12, 23, 43.
    a. 23
    b. 25
    c. 11
    d. 21

3. There is a weighing scale with two pans. In the first case, 2 yellow balls and a pink ball supports a weight of 30 kg. In second case, one yellow and one pink ball supports the weight of 2 green balls. In third case, 2 green and a pink ball support the weight of 2 yellow balls. Find the value of the weight that we will need to support the weight of 3 green balls.

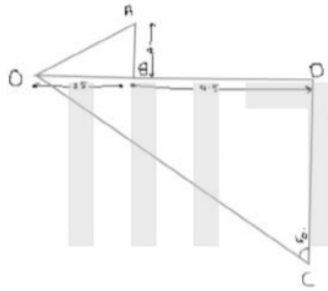


    a. 21
    b. 30
    c. 27
    d. 24

4. Given that A is a 2x2 matrix such that A = $\begin{bmatrix} cos\emptyset & sin\emptyset \\ -sin\emptyset & cos\emptyset \end{bmatrix}$; A^k $\begin{bmatrix} \cos {}^{\emptyset}/_{2} \\ \sin {}^{\emptyset}/_{2} \end{bmatrix} = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$ then find k.
   a. (2n-1)π/2
   b. (2n-1)π
   c. nπ
   d. nπ/2

5. If f(x) = $\int e^x \left(\frac{x^2+x+1}{\sqrt{x^2+1}}\right) dx$ such that the value of the function is 1 when x vanishes, find the value of f(1).
   a. $\sqrt{3}$e b. $\sqrt{5}$e
   c. $\sqrt{2}$e d. e

6. In the following figure the lengths(in cm) of some sides are given. Find the length of DC(in cm).

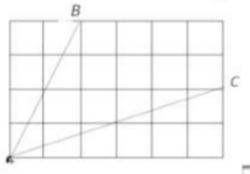


   a. 3
   b. 6
   c. $\sqrt{3}$
   d. $\sqrt{2}$

7. Bag contains 17 balls of 4 different colours. There exists minimum of 2 balls of a particular colour in the bag. Bag contains maximum number of green balls and the number of balls of any two colours aren't the same. If we randomly pick 11 balls from the bag such that there should be at least two balls of the same colour and the remaining balls of another colour. Then the probability of having at least one green ball among those 11 balls picked from the bag?
   a. 2/3
   b. 17/97
   c. 52/53
   d. ½
   e. None of these

8. In the expansion of $(1+x)^{m+n}$,
   a. Coefficient of x^m > coefficient of x^n
   b. Coefficient of x^m < coefficient of x^n
   c. Coefficient of x^m = coefficient of x^n
   d. Nothing can be said for coefficient of x^m and coefficient of x^n

9. Find $\angle CAB$ from the following figure



   a. 30 deg
   b. 45 deg
   c. 60 deg
   d. None of these

10. In a series LR circuit the ratio of inductive reactance and resistance is $\sqrt{3}$. In this case the power factor of the circuit is P_1. Now a capacitor is connected to the existing circuit in series such that the circuit resonates. The power factor of the circuit in this case is P_2. Find $\frac{P_1}{P_2}$?
    a. 0
    b. $\sqrt{3}$
    c. ½
    d. 1

11. Two containers of equal volume with gases at different conditions are mixed as shown. Find the final temperature T in terms of the available data.

n_1 moles
C_1 heat capacity
T_1 initial temperature
+
n_2 moles
C_2 heat capacity
T_2 initial temperature

C_1 heat capacity + C_2 heat capacity

T_1 initial temperature
T_2 initial temperature

   a. $\frac{n_1C_2T_1 + n_2C_1T_2}{n_1C_1 + n_2C_2}$
   b. $\frac{n_1C_1T_1 + n_2C_2T_2}{n_1C_1 + n_2C_2}$
   c. $\frac{n_2C_2T_1 + n_1C_1T_2}{n_1C_1 + n_2C_2}$
   d. None of these

12. A mixture of ice at 0°C (mass=M_{iron}) and water (mass=M_{water}) at 0°C was present. An iron ball of mass M_{iron} at T_1° was dropped into the bowl. If the specific heat of water is C_w and latent heat of ice is L_i and specific heat of iron is C_{iron}, find the final temperature of the iron block. (Assume that entire ice melts)
    a. $\frac{M_{iron}C_{iron}T_1 + M_{iron}L_1}{M_{iron}(C_W+C_{iron}) - M_{water}C_W}$
    b. $\frac{M_{iron}C_{iron}T_1 - M_{iron}L_1}{M_{iron}(C_W+C_{iron}) + M_{water}C_W}$
    c. $\frac{M_{iron}C_{iron}T_1 + M_{iron}L_1}{M_{iron}(C_W-C_{iron}) + M_{water}C_W}$
    d. $\frac{M_{iron}C_{iron}T_1 - M_{iron}L_1}{M_{iron}(C_W+C_{iron}) - M_{water}C_W}$

13. Which of the following statements is correct
    a. The function n! increases faster than n^n
    b. The function $n^{\log n}$ increases faster than n!
    c. The function n! increases slower than $\log_n n$
    d. The function n! increases faster than $(n-e)^n$

Passage for Q 14-15

Following addition is given such that each letter represents a digit

$$\begin{array}{cccc} & R & Q & Q \\ + & S & S & Q \\ & 3 & S & R \\ \hline & Q & 8 & R \\ \hline \end{array}$$

14. What can be the value of Q + R + S ?
    a. 4
    b. 5
    c. 7
    d. 10

15. In the above question Q can be
    a. 4
    b. 5
    c. 1
    d. 0

16. Heating of a dicarboxylic acid doesn't give what as a product ?
    a. Cyclic ester
    b. Carbon dioxide
    c. Monocarboxylic acid
    d. Aldehyde

17. What day comes a day after two days after a day that comes immediately after a day that comes after a day after two days after Monday?
    a. Monday
    b. Tuesday
    c. Friday
    d. Thursday

18. What material would you prefer to calculate earth's magnetic field?
    a. Solid iron
    b. Liquid iron
    c. Steel
    d. Magnesium

19. What is the distance of (1,1,1) from nearest point on 2x+2y+2z+3=0
    A) 9/2√3
    B) 22/2√3
    C) 11/4√3
    D) 11/3√3
    E) none of these

Passage from 20 to 23

If the word FTMR translates to GUNS and ANLA translates to BOMB

20. What does FORWARD stand for?
    a. XLROUQB
    b. GPSXBSE
    c. ANUSLTP
    d. ZQRTPYL

21. CODE will be encrypted as ?
    a. ANQU
    b. PTYN
    c. PPEF
    d. RWCE

22. What will be the original word of 'AOQRHM'
    a. PARIS
    b. ZNPQGL
    c. TOKYO
    d. MILAN

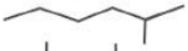
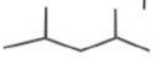
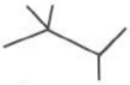
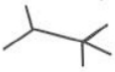
23. No. of alphabet(s) that didn't changed is? (Incomplete Question -> Skip it)
    a. 0

b. 2
c. 1
d. 5

24. What is day after 2 days before the subsequent day after 2 days after Wednesday?
   a. Saturday
   b. Thursday
   c. Wednesday
   d. Friday
   e. Monday

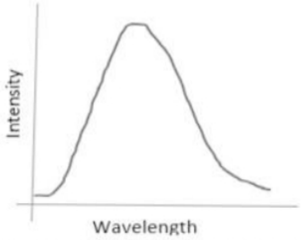
25. If earth is taken as centre and Venus, Jupiter and the Sun revolve around earth. What is the order of their radius from earth?
   a. Rv>Rs>Rj
   b. Rj>Rs>Rv
   c. Rv>Rj>Rs
   d. None of these

26. Spin quantum number can take values s=+1/2 and s=-1/2. If s can also take s=0 then the atomic number of the first 3 noble gases are?
   a. 3,12,18
   b. 3,15,27
   c. 4,14,21
   d. 3,8,16
   e. None of these

27. A compound with molecular formula C_7H_{16} which is optically active can be ?
   a. 
   b. 
   c. 
   d. 
   e. None of these

Passage for Q 28-31

We receive radiations from different sources in the universe like the Sun, some stars etc. The graph of intensity vs wavelength of exposure of radiations to the earth is given below:



28. If the temperature of the sun's surface increases then what will happen to the graph?
   a. Max intensity increases and the graph shifts leftwards
   b. Max intensity increases and the graph shifts rightwards
   c. Max intensity remains same and the graph shifts leftwards
   d. Max intensity remains same and the graph shifts rightwards

29. What is the wavelength of most exposed radiation?
   a. 50nm
   b. 5000nm
   c. 500nm
   d. 50000nm
   e. >50000nm

30. Which is the most harmful exposed radiation to the earth?
   a. 50nm
   b. >500nm
   c. <500nm
   d. None
   e. 1000nm

31. In the black body. What is the meaning of the term 'black' ?
   a. Total absorption of light of all wavelength
   b. Absorption of higher wavelength
   c. Darker than brown
   d. Absorption of lower wavelength of light

32. Ψ_1 and Ψ_2 are two functions such that Ψ_1 is injective and A→B and Ψ_2 is onto and B→A.
   Statement 1- $\Psi_1 \text{ o } \Psi_2$ may or may not exist
   Statement 2- $\Psi_1 \text{ o } \Psi_2$ exists and $\Psi_2 \text{ o } \Psi_1$ is not bijective.
   (Where fof = f(f(x)))
   Select the correct option
   a. S1 and S2 both are correct

b. S1 is correct and S2 is incorrect
c. S2 is correct and S1 is incorrect
d. S1 and S2 both are incorrect

33. 13 white balls and 13 black balls are present. If all balls of same colour are different, then no. of ways of choosing 3 white balls and 5 black balls is?
  a. 368000
  b. 368900
  c. 368052
  d. 368082

Question from 34 to 36: In a secret military operation, a certain code was developed to encode different words. A few of them are listed below:

CODE is written as JVIH
GOAL is written as FVLA
SECRET is written as ZHJYHU
FLAVOUR is written as GALOVTY
In the same code find the way the following words will be written:

34. MATHS = ?
  a. WLQER
  b. XLQEZ
  c. WLQEN
  d. XLQER
35. SUPR = ?
  a. RPSY
  b. RSRU
  c. RPUS
  d. ZPUY
36. REAP = ?
  a. XLHU
  b. VULA
  c. YHLU
  d. None

37. Some textbooks say that woollen sweaters have some sir pockets. They keep us warm. What is the actual reason?

  a. The air trapped inside acts as an insulator
  b. There is nothing with air, wool is a bad conductor of heat.
  c. Warm air gets trapped
  d. CO_2 trapped in air pockets is insulator.

38. Draw correct conclusions from the following given statements:
  (Consider the meaning of the following sentences as absolute truth for this question)
  All cricketers maintain diet
  All famous sportspersons are cricketers

  a. All famous sport persons maintain diet
  b. All famous person are cricketers
  c. All the people who maintain diet are cricketers
  d. None of these

39. Using quantum mechanics birds have the ability to sense magnetic field of earth and magnet. This cannot be studied by classical physics due to?
  a. Fast-flowing River
  b. High mountains
  c. Molecules in bird’s eyes
  d. Forest fires

40. In a class there are four kids Hermone, Dracow, Claire, Lumen. One of them had written “muggles are awesome” on the black board at 10 pm. Professor Snapey wants to find out the culprit. He questions all of them and gets following answers:
  Lumen said : Claire did it
  Dracow said : Hermone didn’t do it
  Hermone said : Lumen didn’t do it
  Claire said : Lumen was playing Minecraft with Hermone at 10 pm
  Who is the culprit?
  a. Lumen
  b. Hermone
  c. Claire
  d. Dracow

41. Suppose a post office sells only 5rs. and 9rs. stamps, then which one of the following is true?
  a. People can buy stamps of rs.33 or more
  b. People can buy stamps of rs.34 or more
  c. People can buy stamps of rs.25 or more
  d. People can buy stamps of rs.14 or more

Passage for Q 42-48

Tribes in some regions of South Africa speak a language called Zulu. Some sentences are translated from English to Zulu below:

English	Zulu
I speak	ngiyakhuluma
I spoke	ngiyakhulama
I never spoke	ngiyaukhulamasoze
You speak quickly	uzasheshakhuluma
We speak	sakhuluma
You will speak	uzokhuluma
We never spoke	saukhulumasoze
I drive	ngiyashaleya

Translate the following in Zulu language and write the answers in the box given below each question:

42. I ?

43. You ?

44. We will drive?

45. You will drive?

46. We will never drive quickly ?

47. You drive ?

48. I will drive ?

IIITPREP UGEE 2022 PAPER ANSWER KEY

UGEE 2022 Solution – Paper 1 SUPR

1	C	11	C	21	B	31	D	41	A
2	B	12	D	22	A	32	C	42	D
3	B	13	C	23	D	33	C	43	A
4	B	14	D	24	A	34	C	44	A
5	C	15	B	25	C	35	D	45	C
6	C	16	C	26	C	36	-	46	B
7	B	17	A	27	C	37	C	47	-
8	D	18	D	28	B	38	C	-	-
9	B	19	C	29	B	39	C	-	-
10	C	20	D	30	D	40	C	-	-

UGEE 2022 Solution – Paper 2 REAP

1	A	11	B	21	C	31	A	41	D
2	D	12	B	22	B	32	-	42	ngiya
3	C	13	A	23	MissingValue	33	C	43	Uza
4	A	14	C	24	D	34	B	44	Sazoshaleya
5	C	15	B	25	B	35	D	45	Uzo shaleya
6	C	16	D	26	B	36	C	46	Sazosheshaushaleyasoze
7	B	17	B	27	E	37	A	47	Uzashaleya
8	C	18	B	28	A	38	A	48	ngiyazashaleya
9	B	19	A	29	C	39	B	-	-
10	C	20	B	30	C	40	C	-	-

SUPR Solutions – 2022

Q. 1 $\left.\begin{aligned} u &= -10\text{ cm}\\ v &= +5\text{ cm}\end{aligned}\right\}$ given

$$\frac{1}{v}+\frac{1}{v}=\frac{1}{f}$$

$$\frac{1}{5}-\frac{1}{10}=\frac{1}{f}$$

$$\frac{1}{10}=\frac{1}{f}$$

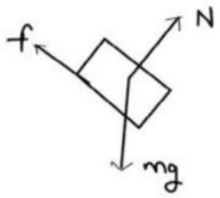
$\therefore f = 10\text{ cm}$ Ans. (c)

Q.2 Relative speeds of their ends $= 10 + 15 = 25\text{ m/s}$

Distance $= 40 + 40 = 80$

$\therefore$ time $= \frac{80}{25} = 3.6\text{ s}$ Ans. (b)

Q.3 FBD diagram of block:



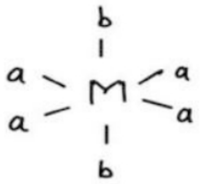
On equating forces we get,

$$\text{Mg}\cos\theta = N$$

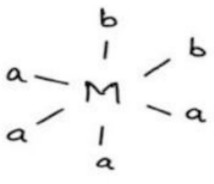
$$\text{Mg}\sin\theta = f$$

$\therefore f = (2)(10)\sin 30° = 10\text{ N}$ Ans. (b)

Q.4 Following isomers are possible



COS & POS



POS

$\therefore$ Optically inactive $\therefore$ Optically inactive

Ans. 2 (b)

Q.5 $$\int \frac{1}{2a}\left(\frac{a+x}{a-x}\right)dx$$

Let $x = a\cos\theta$

$$\therefore \int \frac{-1}{2a}\left(\frac{a+a\cos\theta}{a-a\cos\theta}\right)(a\sin\theta\, d\,\theta)$$

$$\int \frac{-1}{2}\left(\frac{1+\cos\theta}{1-\cos\theta}\right)\sin\theta\, d\theta$$

$$\int \frac{-1}{2}\,\frac{2\cos^2\frac{\theta}{2}}{2\sin^2\frac{\theta}{2}}\quad 2\sin\frac{\theta}{2}\,\cos\frac{\theta}{2}\ d\theta$$

$$-\int \frac{\cos^3\frac{\theta}{2}}{\sin\frac{\theta}{2}}\,d\theta$$

$$-\int \frac{\left(1-\sin^2\frac{\theta}{2}\right)\cos\frac{\theta}{2}}{\sin\frac{\theta}{2}}\,d\theta$$

$$-\int \frac{\cos\frac{\theta}{2}}{\sin\frac{\theta}{2}}\,d\theta + \int \sin\frac{\theta}{2}\cos\frac{\theta}{2}\,d\theta$$

$$2\ln\sin\frac{\theta}{2} + \frac{1}{2}\,(-\cos\theta) + c$$

Now, substituting $\theta = \cos^{-1}\frac{x}{a}$

$2\ln\sqrt{\frac{a-x}{2a}} - \frac{x}{2a} + c$ Ans. (c)

Q. 6

Isothermal	Adiabatic
P_1	P_1
$P_f = \frac{P_1}{2}$	$P_f = \frac{P_1}{2}$
$P_1V_1 = P_fV_{iso}$	$P_1{V_1}^r = P_f{V_f}^r$
$2v_1 = V_{iso}$	$2{v_1}^{5/3} = {V_f}^{5/3}$
	$V_f = 2^{3/5}V_1$

$\frac{V_{adi}}{V_{iso}} = \frac{2^{3/5}V_1}{2v_1} = \frac{1}{2^{2/5}} = \frac{1}{4^{1/5}}$ Ans. (c)

Q.7 We know that

$\Delta\text{T}_b = i\text{k}_b\text{m}$

Since non-ionizable $\therefore i = 1$

$\Delta\text{T}_b = \text{k}_b\text{m}$

$k_b = \frac{\Delta T_b}{m}$

Substitute 1

$k_b = \frac{0.1}{0.51} = 0.196$ Ans. (b)

Q. 8 C $40 \rightarrow \frac{40}{12} \rightarrow 3.33 \rightarrow 1$

H $6.7 \rightarrow \frac{6.7}{1} \rightarrow 6.7 \rightarrow 2$

O $53.3 \rightarrow 53.3/16 \rightarrow 3.33 \rightarrow 1$

$\therefore$ Imperical formula CH_2O

So, from the options, $C_6H_{12}O_6$ can be the answer.

Ans. (d)

Q.9

Q. 10 $\lim_{x\to a} \left(\frac{x^n-a^n}{x-a}\right)$

Since $x \to a$, $\therefore x - a = h$

So, $x = a + h$, where $h \to 0$

Substitute

$$\lim_{h\to 0} \left(\frac{(a+h)^n-a^n}{a-a+h}\right)$$

$$\lim_{h\to 0} \left(\frac{a^n\left(1+\frac{h}{a}\right)^n-a^n}{h}\right)$$

Applying binomial approximation

$$\left(\frac{a^n+a^n\left(\frac{nh}{a}\right)-a^n}{h}\right) = na^{n-1}$$ Ans. (c)

Q.11 $A = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$

$|A^n| = |A|^n$

So, $|A| = \cos^2\theta - (-\sin^2\theta)$

$= 1$

$\therefore \ |A|^n = 1$ Ans. (c)

Q. 12 Since there is second order differential order = 2

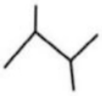
and the power is 1, so deg is 1.

1, 1 Ans. (d)

Q.13 $\int \frac{1}{x^2+a^2}\,dx$

$= \frac{1}{a}\tan^{-1}\frac{x}{a} + c$ (formula based)
Ans. (c)

Q. 14 $a \rightarrow$



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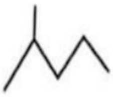
$b \rightarrow$



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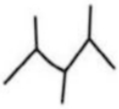
$c \rightarrow$



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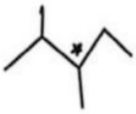
$d \rightarrow$



(active) Ans. (d)

Q. 15 $\frac{\sum x_i}{x} = 10$ $\frac{\sum xi^2}{n} = 110$

Variance $= 6^2 = \frac{\sum xi^2}{x} - \left(\frac{\sum x_i}{x}\right)^2$

$= 110 - (10)^2 = 110 - 100 = 10$

Ans. (b)

Q.16 $\int \frac{1}{x^2-a^2} = \frac{1}{2a}\ln\left|\frac{x-a}{x+a}\right|$
formula based. Ans. (c)

Q. 17 Rotational energy $= \frac{1}{2}\, I\omega^2 = \frac{1}{2}\,(mk^2)\left(\frac{v^2}{r^2}\right) = \frac{1}{2}\, mv^2 \left(\frac{k^2}{r^2}\right)$

Kinetic $= \frac{1}{2}\, mv^2$

Ratio $= \frac{1/2\, mv^2 \left(k^2/r^2\right)}{1/2\, mv^2} = \frac{k^2}{r^2}$ Ans. (a)

Q. 18 $|\bar{a}| = 1$ $|\bar{b}| = 1$

$$|\bar{a} + \bar{b}| = 1 = \sqrt{|\bar{a}|^2 + |\bar{b}|^2 + 2\bar{a}.\bar{b}}$$

$$1 = \sqrt{1 + 1 + 2\bar{a}.\bar{b}}$$

$$\therefore 2\,\bar{a}.\bar{b} = -1$$

Now, $|\bar{a} - \bar{b}| = \sqrt{|\bar{a}|^2 + |\bar{b}|^2 - 2\bar{a}.\bar{b}}$

$= \sqrt{1 + 1 - (-1)} = \sqrt{3}$
Ans. (d)

Q.19 $NH = 15e^-$:
$\sigma 1s^2\ \sigma 1s^2\ \sigma 2s^2\ \sigma 2s^2\ \sigma 2pz^2\ \pi 2px^2 \equiv \pi 2py^2\ \pi * 2px^1 \equiv \pi * 2py^0$

$\therefore 1e^-$ removed from ABMO and full filled achieved,

So, NH^- is stable

Similarly OF^-, CN^-, NO^+ is stable

So, ans. is 4 Ans. (c)

Q. 20 $C\ (series) = \frac{c_1c_2}{c_1+c_2}$ Ans. (d)

Q. 21 $\sin^{-1}\frac{2x}{1+x^2} + \cos^{-1}\frac{1-x^2}{1+x^2}$ $x\,\epsilon\,(1,\infty)$

Let x = tan θ

$$\sin^{-1}\frac{2\tan\theta}{1+\tan^2\theta}+\cos^{-1}\frac{1-\tan^2\theta}{1+\tan^2\theta}$$

$$\theta\,\epsilon\left(\frac{\pi}{4},\frac{\pi}{2}\right)$$

$$\sin^{-1}(\sin 2\theta)+\cos^{-1}(\cos 2\theta)$$

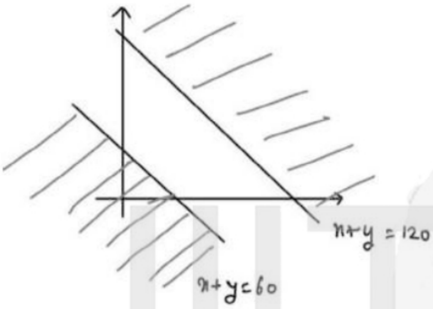
$$2\theta\,\epsilon\left(\frac{\pi}{2},\pi\right)$$

$$\pi-2\theta+2\theta$$

$$=\pi$$ Ans. (b)

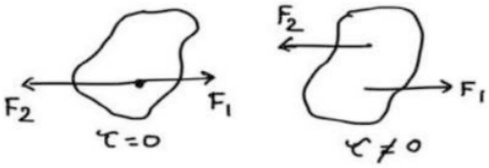
Q. 22 Appropriate count should be 2 + 4(0.1) mm = 2.4 mm Ans. (A)

Q. 23



No common region, so no solutions. Ans. (d)

Q. 24 There should be a net torque on the body for it to rotate. So distance between the forces can't be zero otherwise there would be no net torque.



$\tau=0$ $\tau\neq 0$ Ans. (a)

Q. 25 We know that c = $\frac{E}{B}$

So, $B=\frac{E}{C}=\frac{2700}{3\times10^6}=900\times10^{-8}=9\times10^{-6}=$ 0.009 mT Ans. (c)

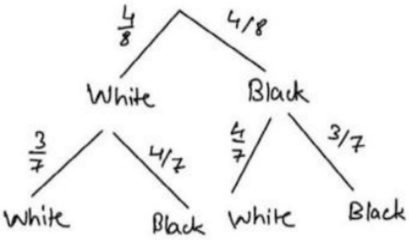
Q. 26 We know $kg=\frac{\Delta T_b}{m}=\frac{0.1}{m}=0.51$

$$m=\frac{10}{51}$$

$$\text{molality}=\frac{\text{moles of solute}}{\text{mass of solvent (kg)}}=\frac{{}^{10}/_{M}}{10}=\frac{1}{M}=\frac{10}{51}$$

$$M=5^{-1}\text{ g/mol}$$ Ans. (c)

Q. 27



$\therefore\frac{4}{8}\cdot\frac{3}{7}=\frac{3}{14}$ Ans. (c)

Q. 28 $p(\text{faulty A}) = p\text{ (choosing A)}\times$ $p\text{ (A being faulty)}$

$$=\frac{1}{2}\times\frac{1}{10}=\frac{1}{20}$$ Ans. (b)

Q. 29 We know that

$$\bar{n}_1.\bar{n}_2=|\bar{n}_1||\bar{n}_2|\cos\theta$$

$$\cos\theta=\frac{(2\hat{\imath}+3\hat{\jmath}+2\hat{k})\ .\ (6\hat{\imath}+2\hat{\jmath}+2\hat{k})}{\sqrt{2^2+3^2+2^2}\quad\sqrt{6^2+2^2+2^2}}$$

$$\cos\theta=\frac{11}{\sqrt{187}}$$ Ans. (b)

Q. 30 Area = $|\bar{A}\times\bar{B}|$

$$=4\sqrt{2}$$

Ans. (d)

Q. 31 Let, length of wire be L

Case I: $2\pi R_1=L$

$$R_1={}^{L}/_{2\pi}$$

$$M_1=niA=(1)(I)(\pi {R_1}^2)$$

Case 2: $4(2\pi R_2)=L$

$$R_2=\frac{L}{8\pi}$$

$$M_2=(4)\frac{I}{2}\,\pi {R_2}^2=2I\,\pi {R_2}^2$$

$$\therefore \frac{M_2}{M_1} = \frac{2\,I\,\pi R_2{}^2}{I\,\pi R_1{}^2} = 2\left(\frac{R^2}{R^1}\right)^2 = 2\left(\frac{1}{4}\right)^2 = \frac{2}{16} = \frac{1}{8}$$

Ans. (d)

Q. 32 $|\bar{a}+\bar{b}| = \sqrt{a^2+b^2} + 2\bar{a}.\bar{b}$

$9 = \sqrt{16+49+\ 2\bar{a}.\bar{b}}$

$2\bar{a}.\bar{b} = 16$

$[\bar{a}-\bar{b}\,] = \sqrt{16+49-16}$

$= 7$ Ans. (c)

Q. 33 $k_{eq} = \frac{20\,(30)}{20+30} = \frac{20(30)}{50} = 12\ \frac{\mathrm{N}}{m}$

$F = kx$

$= 12\,(0.1) = 1.2\ \mathrm{N}$ Ans. (c)

Q. 34 $ax^2+bx+c=0\ ;\ p,q$

$p+q = \frac{-b}{a}$ $pq = \frac{c}{a}$ ....(i)

Now, let $x^2+Bx+C=0$ have root $1+\frac{p}{q}$ & $1+\frac{q}{p}$

$\therefore \left(1+\frac{p}{q}\right)+\left(1+\frac{q}{p}\right) = -B$

$-B = 2+\frac{p^2+q^2}{pq}$

$= 2+\frac{(p+q)^2-2\,pq}{pq}$

$= 2+\frac{\left(\frac{-b}{a}\right)^2}{\frac{c}{a}} - 2 = \frac{b^2\ a}{a^2\ .\ c} = \frac{b^2}{ac}$

$\therefore B = -b^2/ac$

$\left(1+\frac{p}{q}\right)\left(1+\frac{q}{p}\right) = C$

$\mathrm{C} = 1+\frac{q}{p}+\frac{p}{q}+1 = 2+\frac{p^2+q^2}{pq}$

$\therefore$ Eq. : $x^2 - \frac{b^2}{ac}\quad x+\frac{b^2}{ac} = 0$

$acx^2 + b^2\,(1-x) = 0$ Ans. (c)

Q. 35 Now, $\mathrm{mg} = x\,V\rho g$

Where x → part

So, $\rho \propto \frac{1}{x}$

$\rho_B < \rho_c < \rho_A$ Ans. (d)

Q. 36 Standard Statement

Q. 37 $\mathrm{HCl} \rightarrow \mathrm{H^+} + \mathrm{Cl^-}$

10^{-8}

$\mathrm{H_2O} \rightleftharpoons \mathrm{H^+} + \mathrm{OH^-}$

$10^{-8}+x \qquad x$

$kw = [\mathrm{H^+}][\mathrm{OH^-}] = 10^{-14}$

$10^{-14} = x\,(10^{-8}+x)$

$x^2 + 10^{-8}x - 10^{-14} = 0$

$x = \frac{-10^{-8}+\sqrt{10^{-16}}+4x10^{-14}}{2}$

$= \frac{19.02}{2}\times 10^{-8} = 10.01\ \times 10^{-8}$ PH

Q. 38 $2\ \tan^{-1}(\cos x) = \tan^{-1}(\operatorname{cosec} x)$

$\tan^{-1}\left(\frac{2\cos x}{1-\cos^2 x}\right) = \tan^{-1}\left(\frac{1}{\sin x}\right)$

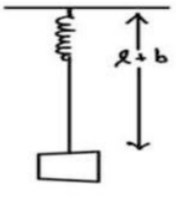
$\frac{2\cos x}{\sin^2 x} = \frac{1}{\sin x}$

$2\cos x = \sin x$

$\tan x = 2$

$\sin x = \frac{2}{\sqrt{5}}$ $\cos x = \frac{1}{\sqrt{5}}$ Ans. (c)

Q. 39



$2n\sqrt{\frac{l+b}{g}}$ Ans. (c)

Q. 40 $\begin{vmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 \end{vmatrix} = 0$

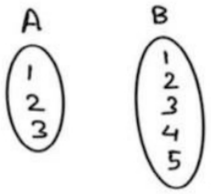
Since these two rows are same, the determinant will be 0. Ans. (c)

Q. 41 (a) .... (fact based)

Q. 42 (d) ………… since area under the curve gives 'fraction' of molecules and not the actual number.

Q. 43 Since it is an endothermic process, the rate increases on increasing temperature, thus amount of gas ↑es, so pressure ↑es. Ans. (a)

Q. 44 Selecting any three elements from B and its arrangement with element of A.



$\therefore\ {}^5C_3 \times 3!$

$5 \,.\, 4 \,.\, 3 = 60$

Total choices = 5^3

$\therefore P(E) = \frac{60}{5\,.5\,.5} = \frac{12}{25} = 0.48$

Ans. (a)

Q. 45 $0.414 \le \frac{R_y}{R_x} < 0.732$ for octahedral void

$\therefore R_y \ge 0.414\, pm$

Ans. (c)

Q.46 for WA-WB salt pH $= 7 + \frac{p\,k_a - pk_b}{2} = 7 + \frac{4.76-4.75}{2} = 7 + 0.005$ Ans. (b)

Q. 47 Standard Statement

REAP – 2022 SOLUTIONS

Q. 1 $5 \ + \ x \ \ge 9$

This die has 6 choices

$\therefore x \ge 4$

$\therefore x = 4,\ 5,\ 6$ (favourable)

Total outcomes $x = 1, 2, 3, 4, 5, 6$

$\therefore P(E) = \frac{\text{favourable}}{\text{total}} = \frac{3}{6} = \frac{1}{2}$ ∴Ans. (a)

Q.2

10, 4, 7, ……., 8, 15, 32, 12, 23, 43

On observation, there are three sets of A.P.s in the above series.

10, ………, 32, 43 →

∴ missing term = $10 + \frac{(32-10)}{2} = 21$ and 4, 8, 12 and 7, 15, 23 Ans. (d)

Q.3 If we assume variable Y weight of yellow ball, G for green & P for pink then, we can write the equations.

$2Y + P = 30$ ………….. i)

$Y + P = 2G$ …………..ii)

$2G + P = 2Y$ …………..iii)

$3G = x$ …………..iv)

We have to find x.

On solving these we get $x = 27$

∴ Ans. (c)

Q. 4 $A = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$

$$A^2 = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}\begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$$

$$= \begin{bmatrix} \cos^2\theta - \sin^2\theta & 2\sin\theta\cos\theta \\ -2\sin\theta\cos\theta & \cos^2\theta - \sin^2\theta \end{bmatrix}$$

$$= \begin{bmatrix} \cos 2\theta & \sin 2\theta \\ -\sin 2\theta & \cos 2\theta \end{bmatrix}$$

Similarly we can say that,

$$A^k = \begin{bmatrix} \cos k\theta & \sin k\theta \\ -\sin k\theta & \cos k\theta \end{bmatrix}$$

Now, $A^k = \begin{bmatrix} \cos\theta/2 \\ \sin\theta/2 \end{bmatrix} = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$

$$\therefore \begin{bmatrix} \cos k\theta & \sin k\theta \\ -\sin k\theta & \cos k\theta \end{bmatrix}\begin{bmatrix} \cos\theta/2 \\ \sin\theta/2 \end{bmatrix} = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$$

$$\begin{bmatrix} \cos k\theta\cos\frac{\theta}{2} + \sin k\theta\sin\frac{\theta}{2} \\ -\sin k\theta\cos\frac{\theta}{2} + \cos k\theta\sin\frac{\theta}{2} \end{bmatrix} = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$$

$$\begin{bmatrix} \cos(k\theta - \frac{\theta}{2}) \\ \sin\left(\frac{\theta}{2} - k\theta\right) \end{bmatrix} = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$$

$$\theta\left(\frac{1}{2} - k\right) = 2\pi T_1 + \frac{T_1}{2}$$

Q. 5 $f(x) = \int e^x\left(\frac{x^2+x+1}{\sqrt{x^2+1}}\right)dx$

$$= \int e^x\left(\frac{x^2+1}{\sqrt{x^2+1}} + \frac{x}{\sqrt{x^2+1}}\right)dx$$

$$= \int e^x\left(\sqrt{x^2+1}+\frac{2x}{2\sqrt{x^2+1}}\right)dx$$

$$= \int d\left(e^x\sqrt{x^2+1}\right)$$

$f(x) = e^x\sqrt{x^2+1}+e$

Given that, $f(0) = 1$

$$\therefore 1 = 1 + c$$

$$\therefore c = 0$$

So, $f(x) = e^x\sqrt{x^2+1}$

$\therefore f(1) = e^1\sqrt{2} = \sqrt{2}e$ Ans. (c)

Q. 6 In the ΔODC,

$$\tan c = \frac{\text{OD}}{\text{DC}}$$

$$\therefore \tan 60^\circ = \frac{2.5+0.5}{\text{DC}}$$

$$\sqrt{3} = \frac{3}{\text{DC}}$$

$\therefore \text{DC} = \sqrt{3}$ Ans. (c)

Q. 7 If you are not able to solve question, Revise probability Chapter from your notes/ Practice Probability & PnC from SUPR Guide, Every Year question comes from Probability
Ans (B)

Q. 8 Coefficient of $x^m = {}^{m+n}C_m$

Coefficient of $x^n = {}^{m+n}C_n$

We know that ${}^{m+n}C_m = {}^{m+n}C_{(m+n)-m} = {}^{m+n}C_n$

$\therefore$ Coeff. Of x^m = Coeff Of x^n Ans. (c)

Q.9 Let one box be of 1 unit² area

$\therefore$ side = 1

To find $\angle x$.

$$\therefore \tan\theta = \frac{2}{4} = \frac{1}{2}$$

$$\tan\propto = \frac{2}{6} = \frac{1}{3}$$

We know that $x + (\theta+\propto) = \frac{\pi}{2}$

$$\therefore (\theta+\propto) = \frac{\pi}{2} - x$$

Taking tan on both sides

$$\tan\left(\frac{\pi}{2}-x\right) = \tan(\theta+\propto)$$

$$\cot x = \frac{\tan\theta+\tan\propto}{1-\tan\theta\tan\propto}$$

Substituting values

$$\cot x = \frac{\frac{1}{2}+\frac{1}{3}}{1-\frac{1}{6}} = \frac{5}{5} = 1$$

$\therefore x = 45^\circ$ Ans. (b)

Q. 10 Let resistance be R, $\therefore X_L = \sqrt{3}R$

$$\therefore \tan\theta = \frac{X_L}{R} = \sqrt{3}$$

$$P_1 = \cos\theta = \frac{1}{2}$$

Now, as circuit is in resonance, $\tan\theta = 0$

$$\therefore \text{P}_2 = \cos\theta = 1$$

So, $\frac{\text{P}_1}{\text{P}_2} = \frac{1}{2}$ Ans. (c)

Q. 11 Let heat exchanged = 0

$$\therefore n_1C_1(T-T_1) + n_2C_2(T-T_2) = 0$$

$\therefore T = \frac{n_1C_1T_1+n_2C_2T_2}{n_1C_1+n_2C_2}$ Ans. (b)

Q. 12 First step : ice melts

Let temp. of iron after melting be T_1^1

$$\therefore (M_{iron})L_1 = (M_{iron})\,C_{iron}\,(T_1 - T_1^1)$$

$$\therefore T_1 - \frac{L_1}{C_{iron}} = T_1^1 \quad \text{...........(i)}$$

Now, we have water at 0°C and iron at T_1^1.

$(M_{iron} + M_{water})$ (M_{iron})

Let final temperature of the system be T

$\twoheadrightarrow \therefore (M_{iron} + M_{water})\,C_w\,(T - O) = (M_{iron})C_{iron}\,(T_1^1 - T)$

$\twoheadrightarrow T[(M_{iron} + M_{water})\,C_w + M_{iron}\;C_{iron}] = M_{iron}\;C_{iron}\left(T_1 - \frac{L_1}{C_{iron}}\right)$

$\twoheadrightarrow \quad \therefore T = \frac{M_{iron}\;C_{iron}\;T_1 - M_{iron}\;L_1}{M_{iron}\;(C_w+C_{iron})+M_{water}\;C_w}$ Ans. (b)

Q. 13 a) $n! = n.(n-1).(n-2).\,\ldots\ldots\ldots\,.3.2.1$

$n^n = n\,.\,n\,.\,n\,.\;n\,\ldots\ldots\ldots\ldots$ n.n

$\therefore$ n^n grows faster than $n!$

So option A is incorrect.

Q. 14 Since in the once place, we are getting the same digit R after carry over, therefore $\theta + \theta$ should be 10

$$\text{So } \theta = 5 \text{ And } \theta + 5 + 5 + (1) = 8$$

From carry over

$$\therefore 5 + 25 = 7$$

$$5 = 1$$

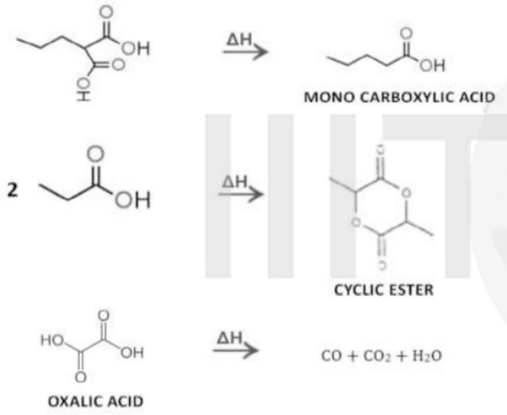
And $R + S + 3 = \theta \quad \therefore R + 1 + 3 = 5$

$$R = 1$$

$\therefore Q + R + S = 5 + 1 + 1 = 7$ Ans. (c)

Q. 15 $\theta = 5$ Ans. (b)

Q. 16



SO, OPTION D IS CORRECT

Q. 17 Start from the end of the question.

⇒ two days after Monday → Wednesday

⇒ a day after (two days after → Thursday Monday)

⇒ a day that comes after (a day → Friday after two days after Monday)

⇒ a day that comes immd. After → Saturday (a day that comes after a day

After two days after Monday)

⇒ two days after (a day that → Monday comes immd. After a day that) comes after a day after two days after Monday.

⇒ day that comes a day after → Tuesday (two days after a day that comes Immd. After a day that comes After a day after two days after Monday) Ans. (b)

Q. 18 Deep within Earth, swirling liquid iron generates our planet's protective magnetic field.

Q. 19 ⊥ distance:

$$\frac{|2(1)+2(1)+2(1)+3|}{\sqrt{2^2+2^2+2^2}} = \frac{9}{\sqrt{12}} = \frac{9}{2\sqrt{3}} \qquad \text{Ans. (a)}$$

Q. 20 Alphabet Increase by 1

Eg, A -> B, B -> C, C -> D

Q. 21 Same logic as 20

Q. 22 Decrease Alphabet by 1 else refer Practice some questions from REAP Guide

Q. 23 Ambiguity in Que, This que is added here just to give idea to you like which type of question and how it can be asked

Q. 24 Start from end

Use the same method as Q. 17

Ans. (d)

Q. 25 According to Kepler's third law or law of harmonics, the ratio of orbital period to orbital distance for each planet is 1. Thus, from the formula for the law of harmonics,

$1 = \frac{T^2}{R^3}$ where, T = orbital period and R = orbital distance.

$$\therefore \frac{T_e^2}{R_e^3} = \frac{T_p^2}{R_j^3}$$

Mean Orbital Radius

In case of orbital motion as $v = \sqrt{\left(\frac{GM}{r}\right)}$ so $T = \frac{2\pi r}{v} = 2\pi r\sqrt{\frac{r}{GM}}$, i.e., $M = \frac{4\pi^2 r^3}{GT^2}$

Q. 26 First noble gas $1S^3$ → 3

2nd $1S^3 2s^3 2p^9$ → 15

3rd $1S^3 2s^3 2p^9 3s^3 3p^9$ → 27 Ans. (b)

Q.27 Among the given none of the compound have a chiral centre, so all are optically inactive.

Ans. (e)

Q.28 Since power = 6 AT^4 and intensity = $\frac{\text{power}}{\text{area}}$

$\therefore$ T ↑ intensity ↑

And we know that $\lambda T = b$

So, $\lambda \uparrow$ if T ↓ & $\lambda \downarrow$ if T ↑

So intensity increases & graph shifts leftwards.
Ans. (a)

Q. 29. The skin and eyes are most sensitive to damage by UV at 265–275 nm, which is in the lower UV-C band. At still shorter wavelengths of UV, damage continues to happen, but the overt effects are not as great with so little penetrating the atmosphere.

Q. 30

Q. 31 Black body is a body that absorbs all radiation falling on it. Ans. (a)

Q. 32

Q. 33 Answer $^{13}C_3 \times {}^{13}C_5 = 368052$ Ans. (c)

Q.34 As we can see

C O D E → J V I H

G O A L → F V L A

S E C R E T → Z H J S H U

F L A V O U R → G A L O V T Y

From this we can deduce the following pattern:

A ↔ L
B ↔ K
C ↔ J
D ↔ I
E ↔ H
F ↔ G

M ↔ X
N ↔ W
O ↔ V
P ↔ U
Q ↔ T
R ↔ (S)

(Y) ↔ Z
S

$\therefore$ R ≡ Y & Z ≡ S

$\therefore$ M A T H S → X L Q E Z $\therefore$ Ans. (b)

Q. 35 S U P R → Z P U Y $\therefore$ Ans. (d)

Q. 36 R E A P → Y H L U $\therefore$Ans. (c)

Q. 37 Ans. (a) [Fact based]

Q. 38 Ans. (a)

Q. 39 By observing the apparent nighttime rotation of the stars around the North Star, the birds learn to locate north before they embark on their first migration.

Ambiguity in Question so, you can skip $\therefore$Ans (B)

Q. 40 Lumen and Hermone were playing and this got confirmed also because dracow said hermon didn't did this.

Practice This type of Question from Our IIITprep REAP Guide for Best Performance.

Q. 41 Equation will be $9x + 5y =$ Amount

Where x, y are whole numbers only

So, at $x = 1$ & $y = 1$ gives 14 . $\therefore$Ans (D)

Q. 42 I – ngiya
Speak – khuluma
Spoke – khulama
Never : ending (soze) , starting (u)
Quickly : Shesha
You : uza
You will : uzo
We : sa
Drive : Shaleya

Q. 43 Uza

Q. 44 Sazoshaleya

Q. 45 Uzo shaleya

Q. 46 Sazosheshaushaleyasoze

Q. 47 Uzashaleya

Q. 48 ngiyazashaleya

--------------------X--------------------

UGEE 2023 MEMORY BASED PAPER

IIITPREP PUBLICATION

UGEE 2023 Paper Pattern

PAPER	No. of Que	Time	Marking	Total Marks	Negative Marking
UGEE 2023	100	3 hr		150	
SUPR	50	1 hr	+1	50	-0
REAP	50	2 hr	+2	100	-0.5

TIME : 3 HRS *TOTAL MARKS : 150*

Q1. There are 4 different hairstylists and they have 4 clients. Every hairstylist charges some more money from their clients.

Name of clients: Raju, Babu, Ayush, Akash

Name of hairstylists: Rahul, Lokesh, Wadeel, Dev

Fees: 150Rs, 160Rs, 170Rs, 180Rs

i. Raju paid more than Rahul's client.
ii. Babu paid 20 Rs more than Dev's client.
iii. Raju paid 10 Rs less than Lokesh's client.
iv. Rahul's clients, Raju, and Babu are all different persons.
v. Either Rahul's client or Babu who paid the highest amount of money.

Who paid how much money to whom?

A. Raju paid 150Rs to Wadeel, Babu paid 160 Rs to Rahul, Ayush paid 170Rs to Lokesh, and Akash paid 180Rs to Dev.
B. Babu paid 150Rs to Dev, Raju paid 160 Rs to Wadeel, Ayush paid 170Rs to Lokesh, and Akash paid 180Rs to Rahul.
C. Ayush paid 150Rs to Rahul, Akash paid 160 Rs to Dev, Raju paid 170Rs to Wadeel, and Babu paid 180Rs to Lokesh.
D. Akash paid 150Rs to Lokesh, Ayush paid 160 Rs to Rahul, Babu paid 170Rs to Dev, Raju paid 180Rs to Wadeel

Q2. Water is essential for the germination of seeds and the growth of plants. Buy why does excess watering kill the plants and rot the seeds?

A. Excess water speeds up the process of life and therefore the plants die.
B. Excess of water means excess of salts dissolved in it. These salts poison the plant and kill it.
C. Excess water restrains and cuts off the supply of oxygen that roots rely upon to work appropriately.
D. Excess water rots the seeds.
E. All of the above.

Passage-based question:

For shooting a skydiving stunt for a movie, the Male skydiver will jump first then the Female skydiver will follow him and during the fall, the female skydiver has to reach the male skydiver. Answer the following question

Q3. How much does the second diver jump for him to reach the first diver

A. Bend the body close to reduce air resistance
B. stretch the body the increase the acceleration due to gravity
C. Tuck into a ball to decrease air drag.
D. Extend limbs outward to catch more air and slow down.
E. Maintain a neutral body posture for optimal control.

Q4. Comments about the acceleration and velocity of divers

A. Velocity decreases as they go down
B. Acceleration due to gravity increases as they go own
C. They achieve a terminal velocity after some time
D. No velocity

Q5. The direction of acceleration immediately changes __________ after the divers open their parachutes.

A. Downward
B. Upward
C. Upward then Downward
D. Downward then Upward

Passage-based Question:

Women are always neglected when it comes to health and nutrition. In many countries, the men and women ratio is less because women are not getting as much nutrition and medical care compared to men. In India, death just after giving birth is very common for women of every age. This is only because of neglecting the proper care of women. The man-woman ratio in some of the rich states of India like Punjab, Haryana, etc., is very low compared to Kerala, which has a man-woman ratio similar to Japan, etc. This condition is different in the countries of the 'third world'.

Although using the term Third World is not useful because there is no certainty of the men-women ratio in different countries.

Q6. What makes Kerala more special than the northern states?

A. It's the literacy of the people
B. It matches the developed countries in terms of men-women ratio
C. There is nothing special about it
D. None of the above

Q7. Why is the men-women ratio less in some countries like India?

A. Men live longer than women
B. It's just bad luck
C. Women are not provided with proper nutrition and medical care
D. Insufficient data

Q8. The concept of 'Third World ' is useless for the author. Why?

A. it's not good to discriminate against other countries by saying 3rd world
B. There is more diversity in other countries
C. Third-world countries are developed countries
D. None of the given options are correct

Q9. If the semimajor axis of Earth is 1. Then how much time would it take for a planet with a semimajor axis 40 to complete one revolution?
A. 10 yrs
B. 40 yrs
C. 254 yrs
D. 342 yrs
E. None

Q10. ${}^{28}C_{2r}$: ${}^{24}C_{(2r-2)}$ = 225:11.
Then the value of r is
A. 7
B. 4
C. 6
D. 9
E. None of the Above

Q11. Which of the following is one-one and onto?
A. A: N-->N f(x) = x^2
B. A: N-->N f(x) = x^4
C. A: Z-->Z f(x) = x^2
D. A: Z-->Z f(x) = x^3
E. None

Q12. If $\frac{d^2y}{dx^2} = \cos\frac{dy}{dx}$, Find the order and the degree of the resulting differential equation.
A. Order 2 degree 4
B. Cannot be determined
C. Order 3 degree 1
D. Data Insufficient
E. None of these

Q13. Find the area enclosed between the parabolas $x=y^2$ and $y=x^2$? ______________

Q14. f(x)=|x| f is a real function, then the function is
A. One-one function but not an onto function
B. One-one and onto function
C. Many - one function but not an onto function
D. Many - one function and an onto function

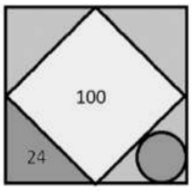
Q15. Three balls A, B, and C are thrown with the same initial velocity one upwards, one Downwards, and one horizontally, what are the final velocities of the all bodies when they hit the ground?
A. $V_a>V_b>V_c$
B. $V_b=V_c>V_a$
C. $V_c>V_b>V_a$
D. $V_a=V_b=V_c$

Q16. Which of the following when mixed will not form a buffer solution?
A. 100ml 0.1 M NaOH + 50ml 0.1 M CH_3COOH
B. 50ml 0.1 M NaOH + 100ml 0.1 M CH_3COOH
C. 50ml 0.1 M NH_4OH + 50ml 0.1 M CH_3COOH
D. 50ml 0.1 M HCl + 100ml 0.1 M CH_3COONa

Q17. $If\ f(x) = \frac{1}{\sqrt{1-x^2}}$, then find $\int f(x)dx$ = ?

A. $\tan^{-1}x + C$
B. $\sin^{-1}x + C$
C. $\cos^{-1}x + C$
D. $-\cos^{-1}x + C$
E. None of these

Q18. Find the radius of the circle if the area of the inscribed square is 100 sq. units and the triangle is 24 sq. units



A. 10
B. 14
C. 2
D. 7
E. None of these

Q19. How many minimum no. of 1 Ω resistors are needed to obtain 7/6 Ω resistance when they are series and parallel?
A. 7
B. 5
C. 2
D. 6
E. 3

Q20. Which forms buffer solutions?
A. 50 ml and 0.1M of HCl and 100 ml and 0.1M NaOH
B. 100ml and 0.5M Na2Co3 and 100ml and 0.5 NaOH

Q21. 3 consecutive terms r, r+1, and r+2 are in an AP of expansion $(1+x)^{14}$. What is the value of r?
A. 5 or 9
B. 5 or 8
C. 4 or 8

The second passage mentions the echolocation of bats (not much detail was given in the paragraph about it. The passage contains only 3-4 lines).

Q22. What is echolocation?
Q23. How do bats communicate through echolocation?
A. using a particular frequency that only bats can hear (and similar options)
Q24. If a bat can hear up to frequencies 50 times more than humans then what is the range in which a bat can hear?
A. 50- 100
B. 500-100000
C. 500-10000
Q25. How does echolocation make bats different from other species?

The third passage was about 2 pipes A and B. Pipe A is a shallow pipe with a base area of 1 m^2. Pipe B is a tube of length 10 cm. Both the pipes are now heated and pipe A absorbs 1kcal of heat and b absorbs 10cal of heat. Now both of them are put together until they attain the same temperature.

Q26. Heat flows in which direction?
A. a to b
B. b to a
C. They both have the same temperature
D. heat does not flow

Q27. When both tubes join together and water is to be passed through them how will the water flow?
A. Turbulent as they have different areas and temperature
B. a to b
C. b to a

Q28. Will the velocity of water change?
A. when moving from a to b increases
B. when moving from a to b decreases
C. when moving from b to increases
D. when moving from b to a decreases
E. none

Q29. Find the missing term
4 7 7 3 a)9
6 1 5 x b) 2
5 x 6 1 c) 5
7 3 4 7

Q31. There are cards with the top painted red, the other side painted black, and another card top painted black and the bottom painted red. The third card painted both sides black. What is the probability that the card selected is red?
A. 1/52
B. 1/51

Q32. 3 coins are tossed simultaneously. Let the event of E is getting "all 3 tails or heads", event F is "at least 2 heads" and event g is "at most 2 heads"
A. All are independent of each other
B. e and f are dependent and e and g are dependent but f and g are independent
C. All 3 dependent on each other
D. Any 2 statements taken will be dependent on each other

Q33. foci (±4,0), semi major axis,(±6,0). Equation of ellipse:
A. $x^2/52 + y^2/36=1$
B. $x^2/36 + y^2/52=1$
C. $x^2/36 + y^2/20=1$
D. $x^2/20 + y^2/36=1$
E. None

Q34. Which element absorbs energy when an electron is added:

A. Na
B. F
C. O
D. N

Q35. Areas under the curve y= x^2 and y=4 ?

Q36. Differentiate sec x wrt x

A. sec(x)tan(x)
B. $\sec(x)^2$
C. $\sec(x)^2 \tan(x)$
D. $\sec(x) \tan(x)^2$

Q37. $\int \frac{-1}{\sqrt{1-x^2}}$

A. $\tan^{-1} x + C$
B. $-\sin^{-1} x + C$
C. $\cos^{-1} x + C$
D. $-\cos^{-1} x + C$
E. None of these

Q38. The arithmetic mean and geometric of the roots of the quadratic equation are 8 and 5 respectively. Which of the following quadratic equation is correct?

A. $x^2 - 16x + 25$
B. $x^2 + 8x + 10$
C. $x^2 + 16x + 10$
D. $x^2 - 8x + 25$
E. None of these

Q39. If $\zeta = i(\frac{1-Z}{1+Z})$

Where Z is any complex number, then which of the following is true?

A. $|Z|>1$ if and only if $\mathrm{Im}(\zeta)>0$
B. $|Z|=0$ if and only if $\mathrm{Im}(\zeta)>0$
C. $|Z|<1$ if and only if $\mathrm{Im}(\zeta)>0$
D. $|Z|<1$ if and only if $\mathrm{Im}(\zeta)<0$
E. None of these

Q40. For which of the following definitions f(x) is both injective and surjective?

A. $f: Z \to Z \; f(x) = x^3$
B. $f: N \to N \; f(x) = x^2$
C. $f: Z \to Z \; f(x) = x^2$
D. $f: N \to N \; f(x) = x^3$
E. None of these

Q41. Find the missing term

7, 16, 25, ?, 43

A. 34
B. 30
C. 37
D. 36

Q42. f(x)=x|x| will be

E. Many One Onto
F. One One Onto
G. Many One Onto
H. One One Into

Q43. A ball is thrown from a tower compare the velocities when it reached the ground
Cases: horizontally upward and downward

A. Same
B. Upward will be having more
C. Downward will be having more
D. None of the Above

Q44. What is the period of tan(cos(x/2)/2)

A. π
B. π/2
C. 2π
D. π/4

Q45. Two planets whose radii are in the ratio of r and orbital velocity in the ratio of r. Then the ratio of acceleration due to gravity will be

A. V^2/R^2
B. V^2/R
C. $2V/R$
D. $V^2/2R$
E. None of the Above

Q46. Three objects of same radius r namely ring, sphere,cylinder are slided, then the ratio of maximum and minimum velocity of the object will be

Q47. There are 3 cards. One card is painted red on both sides. Second one is painted black on both sides. Third card is painted red on one side and black on the other side. If one card is drawn and was found to have red on one side, the probability that the other side is black is.

Q48. Three couples can be arranged in how many ways such that no person sits wit his partner around a circular table

Q49. Data Sufficiency Problem

i. Rahul watch shows the time 14 : 20
ii. Deepika and Jaideep watch Shows same time
iii. Jaideep watch is 10 min slower than Rahul
iv. Zaara watch is small

v. Zaara watch is 5 min fast than the Jaideep watch

Then Zaara watch shows the time 14:15

A. False
B. True
C. we can't say
D. None of these

Q50. Ques based on vector triple product. Which of the following is correct

A. (uxv)xw = ux(vxw)
B. (uxv).w = (u.v).w
C. (uxv).w = ux(v.w)

Q51. After studying the structure of an atom it can be concluded that,

A. Most Part of our body is filled with vacuum
B. We are alive because electrons revolve in fixed orbits.
C. Most Part is filled by protons
D. Most Part is filled by electrons
E. Protons are dispersed and electrons are concentrated.

Q52. The time period and radius of a planet of radius 40 follow the usual Kepler's laws. If the radius of Earth was 1 then what is the time period of the planet?

A. T
B. $40^{3/2}$ T
C. $4^{3/2}$ T
D. None of the above

Q53. If the ratio of escape velocities of planets p and q Is v and the ratio of radius is r what is the ratio of their acceleration due to gravity?

Q54. Acidic strength order of H_2SO_4, $HClO_4$ and HIO_3 ?

Q55. How many structural isomers are there for C_6H_{14}

A. 9
B. 5
C. 6
D. 7
E. None of these

Q56. The height of the object is 2 cm. The distance of the object form the concave mirror is 16. The height of the image is 3cm. What's the focal length of the mirror?

Q57. If the half-life of A = 1/2 half-life of B. Then after 4 half-lives of B, what is the ratio of Na and Nb where Na and Nb are the numbers of molecules of A and B respectively?

Q58. What is the order and degree of the differential equation $d^2y/dx^2 = \cos x$?

Q59. When NaOH is taken in a cylindrical pot shape tube of 1m^2 and HCl is taken in a cylindrical tube of diameter 1mm added methyl orange drops are in the cylindrical pot tube and both tubes are connected what happens

Q60. The value of 1/1! + 4/2! + 9/3! + 16/4!....

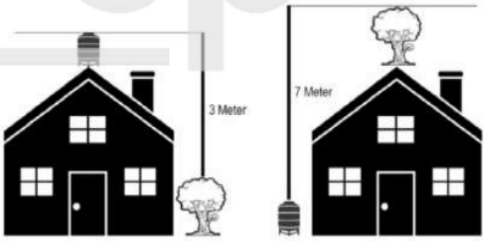
Q61. Find the value of $(125)^{\log_{25} 5}$

A. 15
B. 25
C. $5\sqrt{5}$
D. 3
E. None

Q62. In a certain reaction, if the R isomer of a compound was converted into a new compound with configurations R and S. Then it must have followed which pathway

A. E2 reaction
B. E1 reaction
C. SN1 reaction
D. SN2 reaction

Q63. Find the height of the building.



A. 3
B. 2
C. 5
D. None of the above

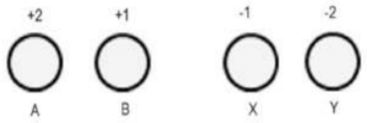
Q64. What is incorrect about benzene:

A. All C-C bond lengths are different
B. Prefers addition reaction over substitution
C. It is an aromatic compound
D. All the carbon atoms exhibit same characteristics

Q65. What is the concentration of H+ ion in blood, given PH = 7.40

A. 2.56
B. 2.51
C. 3.47
D. 4.26

Q66. There are given anions and cations which will combine to form an ionic compound with the greatest lattice energy



- A. AY
- B. AX
- C. BX
- D. BY
- E. XY

Q67. A tank has 8 wheels. A bulldozer has 6 wheels and 2 pair of headlights and an excavator has 6 wheels and 1 pair of headlights. What should be the number of vehicles to have 118 wheels and 20 pairs of headlights?

- A. 5 Tanks, 7 Bulldozers, 6 Excavators
- B. 4 Tanks, 5 Bulldozers, 4 Excavators
- C. 7 Tanks, 5 Bulldozers, 8 Excavators
- D. 3 Tanks, 8 Bulldozers, 7 Excavators
- E. 6 Tanks, 4 Bulldozers, 6 Excavators

Q68. The bob of a pendulum of length l is pulled aside from its equilibrium position through an angle θ and then released. The bob will; then pass through its equilibrium position with a speed v, where v equals to

- A. $\sqrt{2gl(1-\cos\theta)}$
- B. $\sqrt{2gl(1+\cos\theta)}$
- C. $\sqrt{2gl(1-\cos\theta)}$
- D. $\sqrt{2gl(1+\sin\theta)}$

Q70. 1,5,8,10,27,37,88,321,402 have median M. If 3 and 28 are added to the list, then the new median is N. Find M-N ?

Q71. Let $A = \begin{bmatrix} 0 & -\tan\alpha/2 \\ \tan\alpha/2 & 0 \end{bmatrix}$ And let I be an identity matrix of order 2x2, then which of the following options are true?

- A. $I + A = (I - A)\begin{bmatrix} \cos\alpha & \sin\alpha \\ \sin\alpha & \cos\alpha \end{bmatrix}$
- B. $I + A = (I - A)\begin{bmatrix} \cos\alpha & -\sin\alpha \\ \sin\alpha & \cos\alpha \end{bmatrix}$
- C. $I = (I - A)\begin{bmatrix} \cos\alpha & \sin\alpha \\ \sin\alpha & \cos\alpha \end{bmatrix}$
- D. $A = (I - A)\begin{bmatrix} \cos\alpha & \sin\alpha \\ \sin\alpha & \cos\alpha \end{bmatrix}$

Q72. In a school match tournament, 38 medals were awarded in football, 20 in basketball, 15 in cricket. 3 students were awarded medals in all the three sports. In total 58 medals were awarded. Find the number of people with medals in exactly 2 sports?

- A. 18
- B. 9
- C. 11
- D. 5
- E. None of these

Q73. Which of the following does not belong to the power set of {1,2,3,4}?

- A. {1,2,3}
- B. {1}
- C. {1,2,3}
- D. Ø
- E. None of these

Q74. If n is any positive integer belonging to the range [5,100] then the cumulative sum of the number of roots of the equation $x^2 - 2x + n = 0$

- A. 14
- B. 12
- C. 7
- D. 6
- E. None of these

Q75. Consider the condensation of a gas particle on a surface, then which of the following is correct?

(Where $\Delta H = Enthalpy\ change\ and\ \Delta S = Entropy\ change$)

- A. Occurs at T < $\frac{\Delta H}{\Delta S}$
- B. Occurs at T > $\frac{\Delta H}{\Delta S}$
- C. Occurs at T > $\frac{\Delta G}{\Delta S}$
- D. Occurs at T < $\frac{\Delta G}{\Delta S}$

Q76. A company manufactures 2000 items of type I, 4000 items of type II and 6000 Items of type III. The probabilities of accidents during transport are 0.01,0.03 and 0.15 respectively. Suppose an accident occurs. Find the probability that the accident has occurred on type I?

- A. 1/36
- B. 1/52
- C. 1/72
- D. ½
- E. None of these

Q77. Which of the following is diamagnetic in nature

A. $[Fe(CN)_6]^{3-}$
B. $[Fe(Cl)_4]^{2-}$
C. $[Fe(CN)_6]^{3-}$
D. $[Fe(Cl)_4]^{2-}$

Q78. Planet radius is 40 astronomical units. Earth is 1, Then the best value for period of the planet is:

A. 180
B. 450
C. 300
D. 250
E. 80

Q79. Find intersection points of line 2x+y = 3 and ellipse $4x^2 + y^2 = 5$.

a) (1/2,2) , (1,1)
b) (1/2,2) , (1,-1)
c) (-1/2,2) , (1,1)
d) (-1/2,2) , (-1,-1)

Q80. Body is initially moving with speed 1000 cm/s. If work done by a force is -36J. Find speed . (m=2000g)

Q81. Compute the determinant $\begin{vmatrix} 1 & 4.5 & 3 \\ 1.5 & 4 & 2 \\ 5 & 0 & 3.5 \end{vmatrix}$?

Q82. Find alpha (Two Matrix were given, We got this much details from students only):

Q83. Find the mean deviation of median 3,9,5,3,12,10,18,4,7,19,21

Q84. $\lim_{x\to1}\left(\frac{x^{10}-1}{x^5-1}\right)$

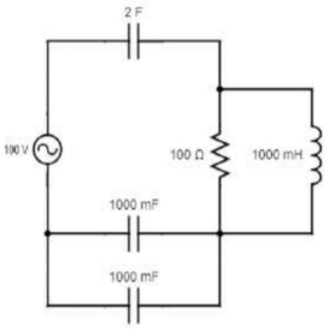
Q85. Assuming all planets follow kepler's laws. Planet P and Planet Q have ratio of their radius of the planet is "r" and ratio of their escape velocities is "v". Find the ratio of their acceleration due to gravity .

A. $\frac{v^2}{r}$
B. $\frac{r}{v}$
C. $\frac{v}{r}$
D. $\frac{r^2}{v}$

Q86. $4x^3 - 6x^2 - 72x + 36 = 0$, *is negative in*?

A. $(-3,2)$
B. (-2,3)
C. $(-\infty,-2)$
D. $(3,\infty)$

Q87. AC circuit with angular frequency =0.519. Find charge on first 2f capacitor.



Q88. A charge is placed in a potential $V(x,y) = x^2 + y^2$. What can you say about its motion?

A. Acceleration in a straight line.
B. Retardation
C. Circular Motion
D. Rest
E. None

Q89. Freezing point of a solution having 4 g solute in 100 g water is -1.4 degree celcius (Kf = 1.86). Find the solute.

A. NaF
B. KF
C. RbF
D. CsF
E. LiF

Q90. Which of the following was lyophobic colloid?

A. Clay
B. Soil
C. Blood
D. Gold sol
E. Both A and D

Q91. Which of the following is non combustible?

A. Oxygen
B. Sulphur
C. CH_4
D. NO

Q92. 5 different balls are given. Two balls are required to make a signal. How many such signals can be made

Q93. From the top of a cliff:

1. A ball was thrown upwards and by the time it reached the ground, its speed was Ua
2. A ball was thrown horizontally and it reached the ground with speed Ub
3. A ball was thrown down with the same speed as both cases and it reaches with speed Uc

Give the relation between?

A. Ua > Ub > Uc
B. Ua < Ub < Uc
C. Ua = Ub = Uc
D. Ua = Ub > Uc

Q94. A salt solution is poured in a container containing charcoal and a dye is added. After many days, a colourful garden is formed? What is the reason.

A. The salt molecules go between the molecules of the charcoal and the water is evaporated, forming dyed crystals
B. The dyed salt solution between the charcoal looks like that
C. The salt solution reacts with t molecules to form complex compounds

DETAILED SOLUTIONS

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IIITPREP

UGEE 2023 SOLUTIONS

UGEE 2024 MEMORY BASED PAPER

IIITPREP PUBLICATION

UGEE 2024 Paper Pattern

PAPER	No. of Que	Time	Marking	Total Marks	Negative Marking
UGEE 2025	90	3 hr		140	
SUPR	40	1 hr	+1	40	-0.25
REAP	50	2 hr	+2	100	-0.5

TIME : 3 HRS *TOTAL MARKS : 150*

QUESTIONS

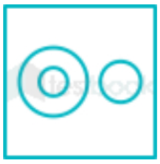
Q1. Scientists are excited about the discovery of HCN (hydrogen cyanide) on one of Saturn's moons. Why is the presence of HCN significant for the possibility of life?

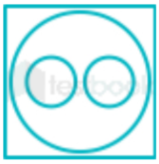
a) Because it has three small elements
b) To see if life was present there before
c) It forms amino acids
d) None of the above

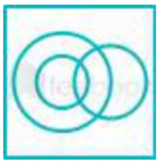
Q2. In a harmonium, why does the left side produce a lower pitch while the right side produces a higher pitch?

a) Because of the saregamapa octaves
b) Because on the left side, a girl is playing and on the right side, a boy is playing
c) Because the buttons are thicker on the left side
d) None of the above

Q3. Which of the following Venn diagrams represents the relation between Cricketers, Musicians & Students?

A.


B.


C.


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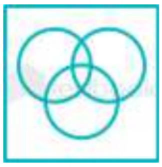


Q4. Which of the following is the correct sequence of entropy?

A) $F_2>Cl_2>Br_2>I_2$ B) $F_2>Cl_2>Br_2>I_2$
C) $I_2>Br_2>Cl_2>F_2$ D) $F_2>Cl_2>Br_2>I_2$

Q5. Which of the following correctly arranges the given items, available in nature, in order from smallest to largest?

a) Hydrogen atom, water molecule, elephant, wolf pack, rainforest, planet Earth
b) Hydrogen atom, water molecule, wolf pack, elephant, rainforest, planet Earth
c) Hydrogen atom, water molecule, elephant, wolf pack, planet Earth, rainforest
d) Hydrogen atom, water molecule, rainforest, wolf pack, elephant, planet Earth

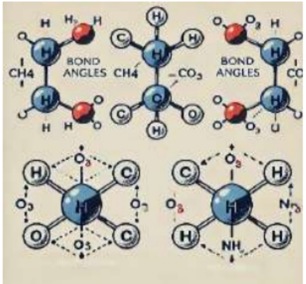
Q6. Consider an object moving along a straight path described by the distance function $s(t)=t^3-6t^2+9t$, where s is the distance in meters and t is the time in seconds. The velocity v(t) of the object is given by the first derivative of the distance function, and the acceleration a(t) is given by the first derivative of the velocity function. Determine the velocity of the object when the acceleration is zero.

a) 3 m/s b) 0 m/s
c) 9 m/s d) 6 m/s

Q7. Calculate the value of sin(945°). Use the properties of trigonometric functions and angle reduction to find the equivalent angle within the standard range.

a) $-\sqrt{2}/2$ b) $\sqrt{2}/2$
c) -1/2 d) 1/2

Q8. Refer to the molecular diagrams below. What are the bond angles for H-C-H, O-C-O, and H-N-H respectively?



a) H-C-H: 109.5°, O-C-O: 180°, H-N-H: 107.3°
b) H-C-H: 120°, O-C-O: 109.5°, H-N-H: 180°
c) H-C-H: 104.5°, O-C-O: 120°, H-N-H: 109.5°
d) H-C-H: 107.3°, O-C-O: 104.5°, H-N-H: 120°

Q9. Consider the following statement and arguments regarding the circulation of vaccines made in Western countries in India:
Statement: Vaccines made in Western countries should be tested before being circulated in India.

Argument 1: The vaccine needs to be tested on the Indian public due to differences in genetic backgrounds, environmental factors, and prevalent diseases which may affect the vaccine's efficacy and safety.
Argument 2: Testing every vaccine in India is not feasible due to the high costs and time required for such processes, which could delay the availability of life-saving treatments.

Based on these arguments, evaluate the validity and choose the most appropriate response:

a) Only Argument 1 is strong because ensuring the safety and efficacy of vaccines tailored to the Indian demographic is crucial.

b) Only Argument 2 is strong because the logistical challenges and costs outweigh the benefits of local testing.

c) Both Argument 1 and Argument 2 are strong, as they highlight important considerations about public health safety and practical feasibility.

d) Neither Argument 1 nor Argument 2 is strong, as they both overlook critical factors that could be mitigated with better planning and international cooperation.

Q10. Arrange the following acids in order of increasing Brønsted acid strength:

A) HI < HBr < HCl < HF
B) HF < HCl < HBr < HI
C) HCl < HF < HBr < HI
D) HF < HBr < HCl < HI

Q11. Calculate the area enclosed by the curve y = x * sqrt(1 - x^2) and the x-axis over the interval from x = 0 to x = 1, where 'sqrt' denotes the square root.

a) 1/3　　b) 1/2
c) 2/3　　d) 3/4

Q12. Consider a room with 23 people. What is the probability that at least two people in this room share the same birthday? Assume that there are no leap years, and each day of the year is equally likely for a birthday.

a) Approximately 50.7%
b) Approximately 23.0%
c) Approximately 75.3%
d) Approximately 90.1%

Q13. In an event with nnn people, there are a certain number of chairs available. If 4/5 of the people occupy seats, and 8/9 of the chairs are taken, leaving 10 chairs unoccupied, determine how many people will remain without a seat when all available seats are taken.

a) 10 people　　b) 15 people
c) 20 people　　d) 25 people

Q14. Consider the scenario of a mountain climber: A person begins their ascent at 10 AM and reaches the peak at 10 PM. The next day, they start their descent at 10 AM, either moving downwards or resting at intervals. Assuming the climber follows the same path for both ascent and descent, how many times will the climber cross the same point at the exact same time of day on two consecutive days?

a) Once　　b) Twice
c) Three times　　d) Not at all

Q15. Determine the number of points of intersection between the following two curves:

$$4x^2+9y^2=1$$
$$4x^2 + y^2 = 4$$

A) 0　　B) 1　　C) 2
D) 3　　E) 4

Q16. In a circuit with a resistor R and a capacitor C connected to a voltage source V_0, the maximum charge Q on the capacitor is:

A) Directly proportional to V_0.
B) The product of R and C.
C) Independent of C.
D) Inversely proportional to R.
E) Directly proportional to C.

Q17. Given the freezing points of solutions as -0.93°C, -1.86°C, and another value for a 0.25 molal solution for chromium complexes. The complexes were $[Cr(H_2O)_6]Cl_3$, $[Cr(H_2O)_5Cl]Cl_2$, and $[Cr(H_2O)_4Cl_2]Cl$. Match the complexes with the given freezing points:

A) $[Cr(H_2O)_6]Cl_3$ corresponds to -0.93°C.
B) $[Cr(H_2O)_5Cl]Cl_2$ corresponds to -1.86°C.
C) $[Cr(H_2O)_4Cl_2]Cl$ corresponds to the other value.
D) $[Cr(H_2O)_5Cl]Cl_2$ corresponds to -0.93°C.
E) $[Cr(H_2O)_6]Cl_3$ corresponds to -1.86°C.

Q18. Find the value of d for which the limit exists:

$$\lim_{x\to 1}\frac{dx^2 - 6x + 15 + d}{x^2 + x - 2}$$

A) 0 B) 1 C) 2
D) -4 E) -6

Q19. Consider a set of 7 numbers. If the largest number in the set is doubled, which of the following measures will change?

A) Mean only B) Median only
C) Both mean and median D) Mode only
E) Neither mean nor median

Q20. A man running at 2 m/s observes 10 buses overtaking him and 15 buses approaching him head-on in a given time period. What is the average speed of the buses?

A) 8 m/s B) 10 m/s
C) 12 m/s D) 14 m/s E) 16 m/s

Passage-based question (Q21-24):
The Otto cycle is the thermodynamic cycle that describes the functioning of a typical spark ignition piston engine. It consists of four distinct processes: two isochoric (constant volume) processes and two adiabatic (isentropic) processes. The cycle begins with an adiabatic compression of the air-fuel mixture by the piston, which increases the temperature and pressure of the mixture. This is followed by a constant volume heat addition, where the mixture is ignited and burned, resulting in a significant increase in temperature and pressure while the volume remains constant. The high-pressure gases then perform work on the piston during the adiabatic expansion process, which reduces the temperature and pressure of the gases. Finally, there is a constant volume heat rejection process, where the exhaust valve opens and the remaining gases are expelled, completing the cycle.

In thermodynamic terms, the efficiency of the Otto cycle is influenced by the specific heat ratio of the gas, the compression ratio, and the temperatures at various stages of the cycle. If the intake air is warmer, it can potentially increase the efficiency by reducing the energy required for compression. Furthermore, increasing the length of the piston's stroke (the distance between the piston's initial and final positions) can increase the engine's efficiency by increasing the compression ratio, leading to a higher temperature and pressure at the end of the compression stroke.

Q21. Based on the Otto cycle described, which thermodynamic graph correctly represents each step of the cycle?

A) P-V diagram B) T-S diagram
C) H-S diagram D) P-T diagram
E) V-T diagram

Q22. In which step of the Otto cycle is work done by the gases on the piston?

A) Adiabatic compression
B) Constant volume heat addition
C) Adiabatic expansion
D) Constant volume heat rejection
E) Isothermal expansion

Q23. If initially we intake warm air into the engine, what effect will it have on the efficiency of the Otto cycle?
A) Decrease the efficiencyB) Increase the efficiency
C) No effect on the efficiency
D) Make the engine run cooler
E) Make the engine run hotter

Q24. If the length of the initial and final positions of the piston (stroke length) is increased, what impact will it have on the efficiency of the Otto cycle?

A) Decrease the efficiency
B) Increase the efficiency
C) No effect on the efficiency
D) Increase the engine's displacement
E) Increase the fuel consumption

Q25. A positive charge is placed in an electric field and moves along the path defined by the equation y = $3x^2$. Determine the force experienced by the charge when it is at the position x = 3.

A) $\vec{F}$= qE in the direction of the electric field
B) $\vec{F}$= qE perpendicular to the electric field
C) $\vec{F}$= qE in the direction of the tangent to the path
D) $\vec{F}$= qE in the direction of the normal to the path
E) None of the above

Q26. A ball of mass mmm is sinking in water. The water exerts a buoyant force of m_1g on the ball. Given that the surface tension of water is C, find the equilibrium speed at which the ball sinks.

A) $\frac{(m-m1)g}{C}$ B) $\frac{(m+m1)g}{C}$
C) $\frac{m1g}{C}$ D) $\frac{mg}{C}$
E) $\frac{(m-m1)g}{m}$

Q27. Convert nitrobenzene to benzene. Identify the correct sequence of reagents and conditions required for this transformation.

A) 1) Sn/HCl 2) NaOH B) 1) H_2, Pd/C
C) 1) $LiAlH_4$ D) 1) Fe/HCl 2) NaOH
E) All of the above

Q28. Consider the following chemical reactions:

1. A + B → C
2. B + C → D
3. D + A → E

Identify which of the given substances are reactants and which are products in the series of reactions.

A) Reactants: A,B,C,D; Products: E
B) Reactants: A,B; Products: C,D,E
C) Reactants: A,B,D; Products: C,E
D) Reactants: B,C; Products: A,D,E
E) Reactants: A,B,C; Products: D,E

Q29. Why do scientists look for the presence of hydrogen cyanide (HCN) on other planets when searching for signs of life?

A) HCN is a simple sugar necessary for metabolism.
B) HCN is a common byproduct of photosynthesis.
C) HCN can participate in chemical reactions that form amino acids and nucleic acids.
D) HCN is a sign of advanced technological civilization.
E) HCN is a major component of the atmosphere in habitable zones.

Q30. Given the equation x1+x2+x3+x4=100 where x1,x2,x3 and x4 are different positive integers with the conditions x1 ≥ 2 and x2 > 0, find the number of solutions satisfying the equation.

A) $\binom{99}{3}$ B) $\binom{98}{3}$
C) $\binom{97}{3}$ D) $\binom{96}{3}$ E) $\binom{95}{3}$

Q31. A spinning circular disc with a radius of 0.2 meters is released from a height of 20 meters above the ground. The axis of rotation of the disc is perpendicular to the surface of the Earth. Assuming no air resistance, find the angular velocity of the disc just before it reaches the ground.

A) ω=$\sqrt{\frac{2gh}{R^2}}$ B) ω=$\sqrt{\frac{gh}{R^2}}$
C) ω=$\sqrt{\frac{2gR}{h}}$ D) ω=$\sqrt{\frac{2gh}{R}}$ E) ω=$\sqrt{\frac{gR}{2h}}$

Q32. A particle is moving according to the parametric equations x=acos(ωt) and y=bsin(ωt), where a and b are different constants. Determine the shape of the path of the particle and whether a force is acting on it

A) The particle forms a circle; no force is acting on it.
B) The particle forms a circle; a force is acting on it.
C) The particle forms an ellipse; no force is acting on it.
D) The particle forms an ellipse; a force is acting on it.
E) The particle forms a straight line; no force is acting on it.

Q33. Consider two waves given by the equations y_1=acos(ωt) and y_2=bsin(ωt+π/2), where a and b are constants. Find the resultant amplitude of the superposition of these two waves.

A) $\sqrt{a^2+b^2}$ B) a + b
C) $\sqrt{a^2 - b^2}$ D) $\sqrt{a^2+b^2 - 2ab}$
E) a − b

Q34. Find the area bounded between the x-axis and the curve y = x$\sqrt{1 - x^2}$.

A) π/4 B) π/8
C) 1/2 D) 2/3 E) 1/4

Q35. A invites 23 guests to a party. Each guest has a birthday on a different day of the year (excluding leap years). What is the probability that at least two guests have their birthdays on the same day

A) $\frac{23}{365}$ B) 1 - $\frac{365!}{(365-23).365^{23}}$

C) $\frac{1}{365}$ D) $1 - \frac{342!}{365^{23}}$ E) $\frac{22}{365}$

Q36. Find the missing number in the sequence:

8, 6, ?, 12, 18, 27, 16, 42, 43, 13, 46, 34.

A) 16 B) 10 C) 29
D) 6 E) 8

Q37. In the given number pyramid, find the value of the missing number.

?
8 6
1 5 10
2 7 13 19

A) 17 B) 12 C) 15
D) 13 E) 19

Q38. Fill in the blank in the following sequence: 2, 5, 10, 17, ___

A) 26 B) 24 C) 23
D) 22 E) 21

Q39. How many integral solutions are possible for the equation $x^2 - 2x + n = 0$ where n is an integer in the interval [5,100]?

A) 5 B) 8 C) 15
D) 20 E) 25

Q40. Given the function $f(x) = \frac{\sin x}{x}$, which of the following statements is true?

A) The minimum value of f(x) is 2/π .

B) f(x) tends to infinity as x approaches 0.

C) f(x) is undefined at x=0.

D) The maximum value of f(x) is 1.

E) f(x) is always positive for all $x \neq 0$.

Q41. A fair coin is tossed a number of times equal to the result of a roll of a fair six-sided die. What is the probability of getting exactly 4 heads in a row during these tosses?

A) ½ B) 1/8 C) 1/16
D) 5/64 E) 1/32

Q42. A pendulum with a time period T_0 is placed in an elevator. The elevator first moves downwards with some acceleration and then moves downwards with a constant speed. How does the time period of the pendulum change in each case

A) The time period is equal to T_0 for both cases.
B) The time period is smaller than T_0 for the first case and equal to T_0 for the second case.
C) The time period is larger than T_0 for the first case and equal to T_0 for the second case.
D) The time period is equal to T_0 for the first case and smaller than T_0 for the second case.
E) The time period is smaller than T_0 for both cases.

Q43. Given the vertices of a triangle are represented by the position vectors $\vec{A}$= [1 2 3], $\vec{B}$= [4 5 6], and $\vec{C}$= [7 8 9], find the area of the triangle?

A) 0 B) 1 C) 5
D) 10 E) 15

Q44. Experiments have found that birds regulate their body temperature by shedding heat, transferring it to their feet/claws, or retaining it through their beaks. With increasing global warming, if birds continue to migrate as they do now, which of the following is likely to happen over time?

A) Birds will shed more heat.
B) Birds will evolve their claws and beaks to better regulate temperature over time.
C) Birds will stop migrating.
D) Birds will decrease their body temperature.
E) Birds will migrate less frequently.

Q45. Argument 1: The vaccine needs to be tested for the Indian public due to differences in genetic makeup, environmental factors, and health conditions.

Argument 2: No, it is not feasible to conduct separate tests for each country due to the urgency of vaccination during a pandemic.

Evaluate the validity of both arguments.

A) Only Argument 1 is strong.
B) Only Argument 2 is strong.
C) Both Argument 1 and Argument 2 are strong.
D) Neither Argument 1 nor Argument 2 is strong.
E) Argument 1 is stronger than Argument 2 but both are valid.

Q46. Consider the function $f(x)=x^3-3x^2+2$. Identify the number of local maxima and local minima in the given function.

A) One local maximum and one local minimum
B) One local maximum and two local minima
C) Two local maxima and one local minimum
D) Two local maxima and two local minima
E) No local maxima or minima

Q47. A ball of mass mmm is dropped into a liquid. The gravitational force acting on it is mg, where g is the acceleration due to gravity. Assume the viscous force acting on the ball is Cμv, where v is the velocity of the ball, μ is the dynamic viscosity, and C is a constant. What is the equilibrium speed of the ball?

A) $\frac{mg}{C\mu}$ B) $\frac{C\mu}{mg}$ C) $\frac{g}{C\mu}$

D) $\frac{m}{C\mu g}$ E) $\frac{C\mu g}{m}$

Q48. Consider the following relations defined on the set of integers Z:

1. $a \sim b$ if $(a-b)$ is divisible by 3.
2. $a \sim b$ if $(a-b)$ is divisible by 2.

Which of these is **not** an equivalence relation?

A) Only relation 1
B) Only relation 2
C) Both relations 1 and 2
D) Neither relation 1 nor relation 2
E) Either relation 1 or relation 2

Q49. Consider a set A of books where the number of pages in each book is denoted by an integer. Two specific books, X and Y, from set A have an equal number of pages. The relation between the number of pages a in book X and b in book Y is such that $|a-b|$ is even. Which of the following statements is true?

A) The number of pages in both books X and Y must be even.
B) The number of pages in both books X and Y must be odd.
C) The number of pages in book X and book Y can be either both even or both odd.
D) The number of pages in book X must be even and in book Y must be odd.
E) The number of pages in book X must be odd and in book Y must be even.

Q50. Find the radius of the circle given by the equation $2x^2+2y^2+8x+8y+1 = 0$.

A) $\sqrt{2}$ B) 2 C) $\sqrt{3}$
D) 3 E) 1

Q51. Consider the electronic configuration notation for an element C_2:

$C_2^{n-} \rightarrow (1s^2)(2s^2)(2p_x^2)(2p_y^1)(2p_z^1)$

Given the configuration, find the value of n?
A) 1 B) 2 C) 3
D) 4 E) 5

Q52. A particle is moving in a straight linear path with displacement $s(t) = t^3-6t^2+6t+1$. Find the velocity of the particle when the acceleration is zero.

A) −6 B) −1 C) 0
D) 1 E) 6

Q53. Find the number of solutions for the equation $(x+1)(x+2)(x+3)(x+4)=0$ under the following conditions:

1. $x \geq 0$
2. $x < 1$

A) 1 B) 2 C) 3
D) 4 E) 0

Q54. Given the matrix $A = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$, which of the following statements is true?

A) $A^{-1} = A$ B) $A^2 = I$
C) $A^3 = I$ D) None of these

Q55. Given the following 3x4 matrix with a missing value in the first row:

$$\begin{array}{cccc} 8 & 6 & x & 12 \\ 18 & 24 & 16 & 24 \\ 23 & 4 & 46 & 8 \end{array}$$

If the sum of the elements in each row equals 35, find the missing value xxx in the first row.

A) 16 B) 29 C) 23
D) 48 E) None of these

Q56. Prachi is designing a rocket for space survival in the solar system. Which system should she use to prevent it from overheating?

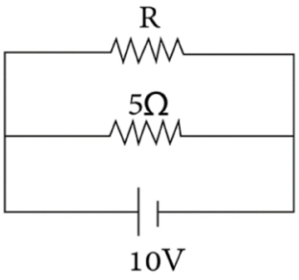
A) She used a plate of material that reflects all the heat if set at a certain orientation.
B) She used an automatic water flow system to make the surface cool.
C) She used a plate of material with a very high melting point than the surface of the sun.
D) There is no higher temperature than the surface of the Earth.

Q57. Any medicine prepared in the UK is first used in India on a sample basis and tested by giving it to someone. Consider the following arguments:

Argument 1: Yes, this is correct and should also happen.
Argument 2: This is not feasible to do every time.

Evaluate the strength of both arguments?
A) Argument 1 is strong, but Argument 2 is not strong.
B) Argument 2 is strong, but Argument 1 is not strong.
C) Both Argument 1 and Argument 2 are strong.
D) Neither Argument 1 nor Argument 2 is strong.

Q58. The power dissipated in the circuit shown in the figure is 30 Watts. The value of R is-



A. 15Ω
B. 10Ω
C. 30Ω
D. 20Ω

Q59. Consider the matrix:

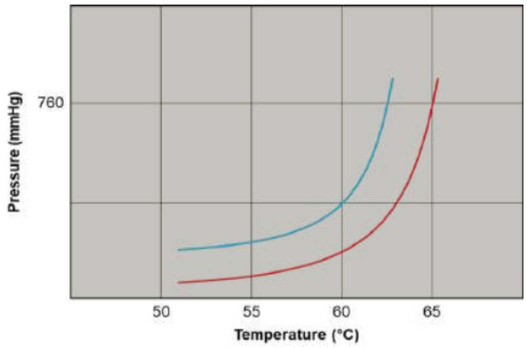
$$P = \begin{matrix} 1 & 1 & 0 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{matrix}$$

The number of distinct eigenvalues of P is:

A. 3
B. 0
C. 1
D. 2

Q60. The following phase diagram shows part of the liquid–vapor phase-transition boundaries for two solutions of equal concentration, one containing a nonvolatile solute and the other containing a volatile solute whose vapor pressure at a given temperature is approximately half that of the pure solvent.

Based on the diagram, what is the approximate normal boiling point of the pure solvent?



A) 50°C
B) 75°C
C) 100°C
D) 125°C
E) 150°C

Q61. A red LED emits light at 0.1 watts uniformly around it. The amplitude of the electric field of the light at a distance of 1 m from the diode is

(a) 5.48 V/m
(b) 7.75 V/m
(c) 1.73 V/m
(d) 2.45 V/m

Q62-66. Simple harmonic motion is the simplest form of oscillation. A particular type of periodic motion in which a particle moves to and fro repeatedly about a mean position under the influence of a restoring force is termed as simple harmonic motion (S.H.M).

A body is undergoing simple harmonic motion if it has an acceleration which is directed towards a fixed point, and proportional to the displacement of the body from that point.

$$\text{Acceleration } a \propto -x \Rightarrow a = -kx \text{ or } \frac{d^2x}{dt^2} = -kx\,,$$

Q62. Which of the following is not a characteristic of simple harmonic motion?

(a) The motion is periodic.
(b) The motion is along a straight line about the mean position.
(c) The oscillations are responsible for the energy conversion.
(d) The acceleration of the particle is directed towards the extreme position.

Q63. The equation of motion of a simple harmonic motion is

(a) $\frac{d^2x}{dt^2} = -\omega^2 x$ (b) $\frac{d^2x}{dt^2} = -\omega^2 t$
(c) $\frac{d^2x}{dt^2} = -\omega x$ (d) $\frac{d^2x}{dt^2} = -\omega t$

Q64. Which of the following expressions does not represent simple harmonic motion?

(a) $x = A\cos wt + B\sin wt$ (b) $x = A\cos(wt + a)$
(c) $x = B\sin(wt + b)$ (d) $x = A\sin wt \cos^2 wt$

Q65. The time period of simple harmonic motion depends upon

(a) amplitude (b) energy
(c) phase constant (d) mass

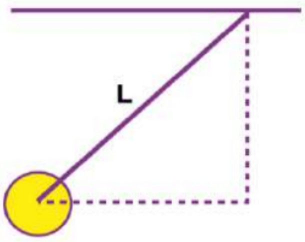
Q66. Which of the following motions is not simple harmonic?

(a) Vertical oscillations of a spring
(b) Motion of a simple pendulum
(c) Motion of planet around the Sun
(d) Oscillation of liquid in a U-tube

Q67. In the reaction $2A + B \rightarrow A_2B$, if the concentration of A is doubled and that of B is halved, then the rate of the reaction will

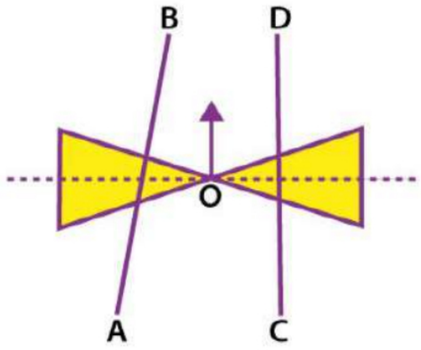
a. increase 2 times
b. increase 4 times
c. decrease 2 times
d. remain the same

Q68. A ball of mass (m) 0.5 kg is attached to the end of a string having a length (L) 0.5 m. The ball is rotated on a horizontal circular path about a vertical axis. The maximum tension that the string can bear is 324 N. The maximum possible value of the angular velocity of ball (in radian/s) is



(a) 9 (b).18
(c) 27 (d) 36

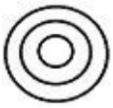
Q69. A roller is made by joining together two cones at their vertices O. It is kept on two rails AB and CD which are placed asymmetrically (see figure), with its axis perpendicular to CD and its centre O at the centre of the line joining AB and CD (see figure). It is given a light push so that it starts rolling with its centre O moving parallel to CD in the direction shown. As it moves, the roller will tend to



(a) turn left and right alternately (b) turn left
(c) turn right (d) go straight

Q70. Which of the following statements is true regarding the relationship between Artificial Intelligence (AI), Machine Learning (ML), and Deep Learning (DL) as shown in the Venn diagram?

Hint Venn Diagram:



A) Machine Learning encompasses both Artificial Intelligence and Deep Learning.

B) Artificial Intelligence is a subset of Machine Learning, which is a subset of Deep Learning.

C) Deep Learning is a subset of Machine Learning, which is a subset of Artificial Intelligence.

D) Artificial Intelligence is a subset of Deep Learning, which encompasses Machine Learning.

Q71. If ω is cube root of unity, then the value of $(1 + \omega - \omega^2)(1 - \omega + \omega^2)$ is

(a) *1* (b) *0*
(c) *2* (d) *None of the above*

Q72-80. Linguistics Ques: Consider the following Swahili Language translation:

atanipenda	s/he will like me
atakupenda	s/he will like you.obj
atampenda	s/he will like him/her
atatupenda	s/he will like us
atawapenda	s/he will like them
anawapenda	s/he likes them
watampenda	they will like him/her
atakusumbua	s/he will annoy you.obj
atakupiga	s/he will beat you.obj
nitakupenda	I will like you.obj
nitampenda	I like him/her
nitawapenda	I will like them
utanipenda	you.subj will like me
utampenda	you.subj will like him/her
tutampenda	we will like him/her
atanipiga	s/he will beat me
atampiga	s/he will beat him/her

Q72. Swahili Translation of "I will beat you" is ___________

Q73. Swahili Translation of "They have like me" is ___________

Q74. Swahili Translation of "They will beat you" is ___________

Q75. Swahili Translation of "He will annoy me" is ___________

Q76. Swahili Translation of "We will beat them" is ___________

Q77. English Translation of "penda" is ___________
(a) Like (b) annoy
(c) beat (d) we

Q78. English Translation of "sumbau" is ___________
(a) Like (b) annoy
(c) beat (d) we

Q79. English Translation of "piga" is ___________
(a) Like (b) annoy
(c) beat (d) we

Q80. English Translation of "tu" is ___________
(a) Like (b) annoy
(c) beat (d) we

DETAILED SOLUTIONS
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IIITPREP
UGEE 2024 Solution

UGEE 2025 MEMORY BASED PAPER

IIITPREP PUBLICATION

UGEE 2025 Paper Pattern

PAPER	No. of Que	Time	Marking	Total Marks	Negative Marking
UGEE 2025	90	3 hr		140	
SUPR	40	1 hr	+1	40	-0.25
REAP	50	2 hr	+2	100	-0.5

TIME : 3 HRS *TOTAL MARKS : 140*

1. During a solar eclipse, the Moon comes between the Earth and the Sun, casting a shadow on Earth. Various factors affect the duration of this phenomenon. Which of the following conditions would most likely result in a longer solar eclipse duration?

(a) Sun and moon move with same velocity
(b) Moon is farther from Earth
(c) Earth stops rotating about its axis
(d) Moon is closer to Earth
(e) None of these

2. In a cryptic language system, each alphabet is substituted with its opposite in the English alphabet, such that A becomes Z, B becomes Y, and so on. Using this logic, decode the following phrase: 'RMWRZ RH NB XLFMGIB'. What does the original English sentence say?

(a) INDIA IS MY COUNTRY
(b) INDIA IN MY POULTRY
(c) BRIBE IN MY POULTRY
(d) BRIBE IS MY COUNTRY
(e) None of these

3. In a reverse-alphabet code, where each letter is replaced by its opposite counterpart (A ↔ Z, B ↔ Y, etc.), you're asked to decode two underlined segments from the string: “$\underline{\text{O}}\underline{\text{Z}}$ $\underline{\text{I}}$ $\underline{\text{T}}$ $\underline{\text{V}}$ OZMTFZTV $\underline{\text{N}}$ $\underline{\text{L}}$ $\underline{\text{W}}\underline{\text{V}}\underline{\text{O}}$.” What meaningful English words are obtained from decoding the underlined parts?

(a) LARGE, MODEL (b) SMALL, MODEL
(c) LARGE, DESIGN (d) SIMPLE, MODEL
(e) None of these

4. In an old town in Telangana, three friends Alpha, Beta, and Gamma are discussing their ages. Alpha states that 6 years ago, he was three times as old as Beta. Beta adds that 8 years from now, he will be one-third the age of Gamma. If the current age of Gamma is S years, what is the current age of Alpha in terms of S?

(a) S – 20 (b) S – 10 (c) 2S – 10
(d) S – 40 (e) None of these

5. You're given two transparent liquids—one is pure water and the other is a sugar solution. You are not allowed to taste or chemically test them. Which of the following experimental methods would best help you identify the sugar solution without using chemical indicators?

(a) Pour both near ants and observe which they prefer
(b) Add lemon; sugar solution turns yellow
(c) Dip wood block; it sinks further in pure water
(d) Boil both; sugar solution gets syrupy then chars
(e) All of the above

6. A researcher tries cooking rice in an open vessel placed on an induction stove on Earth, and then repeats the exact experiment on Mars using the same setup. Due to different atmospheric conditions, the boiling point of water is lower on Mars. What is the most likely outcome of the experiment on Mars compared to Earth?

(a) Rice won’t cook properly as boiling point is lower
(b) Same time as Earth, same results
(c) Cooks better than on Earth

(d) Takes less time on Mars
(e) Takes more time but same quality

7. Two children are playing with soap bubbles on a sunny day. Initially, the bubbles appear blue and purple. As the bubbles become thicker, their color shifts toward a reddish hue. An elderly scientist observing this explains the optical phenomenon. Which explanation best describes the observed color shift due to thickness?
(a) Wavelength shifts toward red
(b) Blue disappears first
(c) Thickness doesn't affect interference
(d) Turns white
(e) None of these

8. You have 6 blue balls and 4 green balls, all distinctly numbered. You need to arrange all 10 balls in a line such that no two green balls are placed adjacent to each other. How many distinct arrangements satisfy this condition?
(a) 151200 (b) 12600 (c) 5040
(d) 840 (e) 210

9. A function f is defined from the set {1,2,3,4,5,6} to {a,b,c,d,e,f}. You are required to find the number of such functions for which $f(1) \neq a$ or $f(2) \neq b$ or both. What is the total number of valid functions under this condition?
(a) 7776 (b) 6720 (c) 1296
(d) 1080 (e) 1024

10. Consider the halogenation (mono-bromination) of 2-methylbutane. During this reaction, bromine substitutes one hydrogen atom in the hydrocarbon chain. Which of the following is NOT a valid product of mono-bromination of 2-methylbutane?
(a) 1-bromo-2-methylbutane
(b) 2-bromo-2-methylbutane
(c) 1-bromo-3-methylbutane
(d) 1-methyl-2-chlorobutane
(e) 2-bromo-3-methylbutane

11. In the atmosphere, ozone plays a crucial role in protecting life on Earth by interacting with ultraviolet radiation. Which of the following best describes the protective mechanism of ozone against harmful UV rays?
(a) Ozone has weak bonds that break with UV and aid ozone-oxygen cycle
(b) Ozone reflects UV rays
(c) Ozone blocks visible light
(d) Ozone creates a vacuum barrier
(e) Ozone emits infrared radiation

12. Consider the expression $(\sqrt{3} + \sqrt{2})^4 - (\sqrt{3} - \sqrt{2})^4$. You are asked to simplify this expression and choose the correct numerical value. What is the final result after computation?
(a) 336 (b) 112 (c) 64
(d) 240 (e) None of these

13. Imagine being shrunk to one-billionth of your actual size and placed on a used sheet of paper. Based on microscopic observations of everyday surfaces, how would this surface most likely appear to you at that scale?
(a) Icy lake (b) Perfectly lined array of atoms
(c) Barren land in hilly area (d) Shiny bright area
(e) Smooth plastic sheet

14, In 1969, the Murchison meteorite crashed in Australia and was later found to contain amino acids—key building blocks of life. What can we reasonably conclude from this scientific observation?
(a) Life on Earth may have originated from meteor strikes
(b) Amino acids accumulated during atmospheric entry
(c) A piece of Earth's soil was blasted into space
(d) Meteorite created amino acids on impact
(e) Meteor was contaminated post-impact

15. You're given a region on the coordinate plane bounded by the parabola $y = x^2$ and a horizontal line $y = 16$. You are asked to compute the total area enclosed between these two curves. What is the resulting area?
(a) 64 (b) 128/3 (c) 256/3
(d) 128 (e) None of these

16. Consider the function $f(x) = [\ln(1-ax) + \ln(1+bx)] / x$. This function becomes undefined at $x = 0$ unless certain conditions are met. What value should $f(0)$ take in order for the function to be continuous and defined at $x = 0$?
(a) a + b (b) -a + b (c) ab
(d) -ab (e) None of these

17. A hotel has rooms numbered from 1 to 49. The owner discovers a unique property: there is one room such that the sum of room numbers before it equals the sum after it. What is the room number that balances both sides?

(a) 24 (b) 35 (c) 25
(d) 30 (e) None of these

18. Evaluate the following limit as x approaches -3: $[\sqrt{(2x + 22)} - 4] / (x + 3)$. Use algebraic methods or rationalization techniques to simplify and determine the correct value.
(a) ¼ (b) ½ (c) 2
(d) 4 (e) None of these

19. You are given the expression $\int[(1 - \tan^2 x) / (1 + \tan^2 x)]\, dx$ and are asked to evaluate it. Use trigonometric identities and rules of integration to find the correct simplified form.
(a) sin(2x) (b) cos(2x) (c) tan(2x)
(d) $\cos^2(x) - \sin^2(x)$ (e) None of these

20. Desert air coolers work by a principle that involves heat transfer. When hot air passes through water-soaked pads, it becomes cooler and more humid. Which of the following best describes the thermodynamic process involved in the functioning of such a cooler?
(a) Carnot engine (b) Isothermal process
(c) Adiabatic process (d) Isotropic process
(e) Isobaric process

21. Two objects at temperatures of 300 K and 600 K are placed inside a perfectly insulated (isolated) system. Over time, thermal energy is exchanged between the two bodies. What is the final expected outcome of this interaction?
(a) The 300K object heats up to 600K
(b) The 600K object cools to 300K
(c) Heat flows until thermal equilibrium is reached
(d) No change occurs
(e) Both become colder

22. In a controlled system, if two substances with different temperatures are placed in thermal contact without any external influence, energy exchange occurs. What principle or law governs the direction of heat flow in such a scenario?
(a) Cold becomes hot
(b) Heat transfers from cold to hot
(c) Heat transfers from hot to cold
(d) No heat transfer occurs
(e) System explodes

23. You are asked to set up a room cooler in a sealed environment with no natural airflow. Which of the following configurations would result in the most effective cooling?
(a) Fan toward window, salt water
(b) Fan toward window, normal water
(c) Fan away from window, salt water
(d) Fan away from window, normal water
(e) Fan perpendicular to window

24. In a sealed room, an air cooler is used continuously with no external air circulation. From a thermodynamics perspective, how should this system be modeled to best reflect the process occurring within?
(a) Isoenthalpic (b) Isobaric
(c) Adiabatic (d) Isothermal
(e) Isochoric

25. Imagine you're standing on a piece of rough, used paper but have been miniaturized to a billionth of your original size. What would the surface look like at this microscopic scale?
(a) Everything appears smooth and shiny
(b) Appears like a frozen lake
(c) Looks like barren hills
(d) Appears wet
(e) Atomically aligned structures are visible

26. A radioactive sample contains 8×10^{12} grams of material. If the half-life of the element is 1600 years, how much of the sample will remain after a total duration of 4800 years?
(a) 10^{12} grams (b) 3.5×10^{12} grams
(c) 2×10^{12} grams (d) 1×10^{12} grams
(e) 0.5×10^{12} grams

27. A Carnot engine is designed to work between two temperature reservoirs: one at 400K and another at 300K. Based on the Carnot efficiency formula, what is the maximum theoretical efficiency of such an engine?
(a) 25% (b) 33% (c) 50%
(d) 75% (e) None of these

28. On a hot sunny day, a person driving down a road notices what looks like water on the asphalt surface far ahead. As the vehicle gets closer, the water-like illusion disappears. This common optical effect experienced in hot areas is caused by which physical phenomenon?
(a) Total internal reflection due to density gradient in air
(b) Refraction by water particles
(c) Reflection from road surface
(d) Diffraction of sunlight
(e) Dispersion of light

29. An object is launched vertically from Earth's surface with a certain speed. To escape Earth's gravitational field without falling back, the object must reach a specific minimum velocity. What is this velocity known as and what is its approximate value for Earth?

(a) 9.8 m/s (b) 11.2 km/s (c) 5.6 km/s
(d) 7.8 km/s (e) 15 km/s

30. A prism is used in a laboratory to separate white light into its constituent colors. Based on the principles of refraction, which color of visible light bends the most when passing through a prism?

(a) Red light (b) Violet light (c) Blue light
(d) Green light (e) Yellow light

31. Two resistors of resistance 4 ohms and 6 ohms are connected in parallel in an electric circuit. Calculate the net effective resistance of this combination using the formula for resistors in parallel.

(a) 2.4 ohm (b) 10 ohm (c) 1.6 ohm
(d) 5 ohm (e) 3 ohm

32. A train starts from rest and accelerates uniformly at the rate of 1 m/s^2. What will be its velocity after 10 seconds from the start of its motion?

(a) 10 m/s (b) 20 m/s (c) 5 m/s
(d) 15 m/s (e) 25 m/s

33. In quantum physics, there exists a fundamental constant that relates the energy of a photon to its frequency. What is the name of this constant and what is its approximate value?

(a) 6.63×10^{-34} Js (b) 3.00×10^{8} m/s
(c) 1.60×10^{-19} C (d) 9.81 m/s^2
(e) None of these

34. A simple pendulum has a time period of T on Earth. If the pendulum is taken to a planet where the gravitational acceleration is only one-fourth that of Earth's, how will the pendulum's time period change?

(a) 2T (b) T/2 (c) T/4
(d) 4T (e) $\sqrt{2}$ T

35. A particle's velocity is defined by the function $v(t) = 3t^2 + 2t$. Find the acceleration of the particle at t = 2 seconds by differentiating the velocity function.

(a) 14 m/s^2 (b) 10 m/s^2 (c) 18 m/s^2
(d) 12 m/s^2 (e) 8 m/s^2

36. When a charged capacitor is connected to a battery, it stores electric charge. Which of the following quantities is directly increased by the presence of the battery in this scenario?

(a) Capacitance (b) Voltage across plates
(c) Charge stored (d) Dielectric constant
(e) Plate area

37. Two capacitors of 6 μF each are connected in series in an electric circuit. Calculate the equivalent capacitance of this configuration.

(a) 3 μF (b) 12 μF (c) 6 μF
(d) 9 μF (e) 18 μF

38. An air cooler is to be installed in a closed room. There are multiple configurations possible depending on the fan orientation and the type of water used. Which configuration would result in the best cooling effect inside a sealed room?

(a) Fan toward window, salt in water
(b) Fan away from window, normal water
(c) Fan away from window, salt in water
(d) Fan toward window, normal water
(e) Fan perpendicular to window

39. A cooler is used inside a room with all doors and windows closed, preventing any air exchange with the outside. Which thermodynamic process best represents the action of the cooler in this situation?

(a) Isochoric (b) Isobaric (c) Isothermal
(d) Adiabatic (e) Isoentropic

40. You are shrunk to a billionth of your original size and placed on a crumpled, used sheet of paper. From this microscopic perspective, how would the surface of the paper most likely appear to you?

(a) Smooth and shiny surface (b) Barren hilly land
(c) A lake-like shiny surface (d) Wet chaotic terrain
(e) Array of orderly atoms

41. A ball is dropped through a tunnel drilled straight through the Earth from one side to the other. Assuming no resistance, where will the ball ultimately come to rest?

(a) At Earth's center (b) Oscillates forever
(c) Just before other end (d) Escapes the tunnel
(e) None of these

42. You are given five different organic molecules and asked to determine which one will most easily undergo an E1 elimination reaction. E1 reactions

typically occur faster with more stable carbocation intermediates. Which compound fits this criterion best?
(a) 2-chloropentane (b) 1-chloro-2-methylbutane
(c) 2-chloro-2-methylbutane (d) 1-chlorobutane
(e) None of these

43. Ionization energy refers to the energy required to remove an electron from a gaseous atom. Among the given options, which element has the highest first ionization energy?
(a) Ozone (b) Oxygen molecule (O_2)
(c) Nitrogen (d) Neon (e) None of these

44. Space-based solar power offers several advantages over Earth-based systems. Which of the following is the most comprehensive explanation of why solar energy collection in space can be more efficient than on Earth?
(a) No day-night cycle (b) More sunlight intensity
(c) No atmospheric distortion
(d) Continuous energy
(e) All of the above

45. You are asked to evaluate the integral of a trigonometric expression: ∫[(tan(2x) + sec(2x)) / sec(2x)] dx. Simplify the expression before integrating. What is the result of the integral?
(a) sin(2x) + C (b) cos(2x) + C (c) sec(2x) + C
(d) tan(2x) + C (e) None of these

46. A mixture consists of 0.5 kg of steam and 2 kg of ice at –18°C. You are to determine the final state of this mixture once thermal equilibrium is reached. Assume ideal heat transfer and no heat loss to surroundings.
(a) Water at 76°C(b) Water at 100°C
(c) Steam above 100°C
(d) Water at room temperature
(e) Ice-water mixture

47. In a room where no external air is allowed in or out, an air cooler is operated continuously. What type of thermodynamic process does this setup best approximate?
(a) Isothermal (b) Isobaric (c) Isochoric
(d) Adiabatic (e) None of these

48. Scientists analyzing the Murchison meteorite, which fell in Australia in 1969, found amino acids—organic compounds essential for life. What can this discovery suggest about the origins of life on Earth?
(a) Life may have originated from meteorites
(b) Amino acids formed in Earth's atmosphere
(c) Meteorites absorbed amino acids during impact
(d) Soil blasted into space became meteorite
(e) None of these

49. In a hierarchical company structure, each manager supervises exactly 2 employees, and entry-level employees do not manage anyone. What is the approximate ratio of entry-level employees to the total workforce?
(a) Nearly ½ (b) Nearly 1/3 (c) Nearly ¼
(d) Nearly 2/3 (e) Nearly 1/5

50. A company's digital archive grows rapidly, doubling in size every month. If the archive begins at 16 TB, calculate the total increase in data from month 4 to the (n–1)th month.
(a) 128(2^(n–5) – 1) (b) 128(2^(n–7) – 1)
(c) 128(2^(n–4) – 1) (d) 128(2^(n–3) – 1)
(e) 16(2^(n–4) – 1)

51. A pendulum has a time period T on Earth. If it is moved to a planet where gravity is 1 million times stronger than on Earth, how is its time period affected?
(a) 1000 times faster (b) 100000 times faster
(c) Same as Earth (d) 100 times slower
(e) None of these

52. A student tries to cook rice using an open vessel on Mars, using the same setup as on Earth. Given that the boiling point of water is lower on Mars, what will be the expected result?
(a) Less than 10 minutes
(b) More than 10 minutes
(c) In 10 minutes
(d) Won't cook as good as Earth
(e) None of these

53. During a solar eclipse, various orbital and rotational dynamics play a role in determining how long the eclipse lasts. Which of the following conditions would most likely cause the duration of a solar eclipse to increase?
(a) Bringing the moon closer to Earth
(b) Bringing the moon farther away
(c) Increasing the Earth's rotation
(d) None of these
(e) Earth stops rotating

54. A drop of water contains billions of molecules. Given that the density of water is 1 g/ml, estimate the number of water molecules in 0.018 ml of water

using Avogadro's number.
(a) 6.02×10^{20} (b) 6.02×10^{21}(c) 6.02×10^{22}
(d) 6.02×10^{24}(e) 6.02×10^{26}

55. In 1969, a meteorite landed in Murchison, Australia, and was found to contain several amino acids—organic molecules essential for life. What inference can be drawn from this discovery regarding the origin of life?
(a) It caught amino acids from Earth's atmosphere
(b) It was part of Earth's soil
(c) It already had amino acids from space
(d) It formed amino acids after CO_2 and H_2O reaction on Earth
(e) It had no amino acids

56. You are given a sample of a radioactive substance with a half-life of 1600 years. If the initial number of atoms is 8×10^7, how many atoms will decay after a duration of 4800 years?
(a) 7×10^7 (b) 1×10^7 (c) 1×10^6
(d) 5×10^7 (e) 4×10^7

57. There are 8 particles P_1 to P_8 located in 3D space. You are told that distances between some specific pairs (like P_1–P_2, P_2–P_3, etc.) are equal. If the coordinates of P_6 are known, how many additional variables are required to determine the coordinates of all other particles?
(a) 24 (b) 19 (c) 16
(d) 13 (e) 10

58. A radioactive substance has an initial mass of 64 grams and a half-life of 1000 years. After 3000 years, what amount of the substance will remain?
(a) 8g (b) 32g (c) 4g
(d) 2g (e) 1g

59. Two 1 kg masses are placed 1 meter apart in space. According to Newton's law of gravitation, what is the magnitude of the gravitational force acting between them?
(a) 6.67×10^{-11} N (b) 9.8 N (c) 1.0 N
(d) 0.1 N (e) Zero

60. Two capacitors of 3 μF and 6 μF are connected in series. What is the equivalent capacitance of this configuration?
(a) 2 μF (b) 6 μF (c) 9 μF
(d) 1 μF (e) 18 μF

61. A satellite revolves around the Earth in a stable circular orbit. Which force is responsible for keeping the satellite in its orbit and preventing it from flying off into space?
(a) Gravitational force (b) Magnetic force
(c) Electric force (d) Centrifugal force
(e) None of these

62. Different types of electromagnetic radiation have different frequencies. Among the options below, which type of electromagnetic wave has the highest frequency and the shortest wavelength?
(a) Radio waves (b) Gamma rays
(c) Microwaves (d) Infrared waves
(e) Ultraviolet rays

63. A car moves from rest to a velocity of 20 m/s over 10 seconds with uniform acceleration. What is the acceleration of the car?
(a) 2 m/s^2 (b) 4 m/s^2 (c) 1 m/s^2
(d) 0.5 m/s^2 (e) 5 m/s^2

64. Vinegar has a characteristic sour taste which is due to the presence of a particular acid. Identify this acid from the options below.
(a) Hydrochloric acid (b) Citric acid
(c) Acetic acid (d) Sulphuric acid (e) Nitric acid

65. Exposure to sunlight helps the human body synthesize a particular vitamin. Which vitamin is produced in the skin upon exposure to ultraviolet rays from the sun?
(a) Vitamin A (b) Vitamin B (c) Vitamin C
(d) Vitamin D (e) Vitamin K

66. Electromagnetic radiation types vary in wavelength. Among the following, which has the shortest wavelength and hence the most energy?
(a) Gamma rays (b) Radio waves
(c) X-rays (d) Infrared rays
(e) Microwaves

67. When an object is placed beyond the center of curvature of a concave mirror, a certain type of image is formed. What are the characteristics of this image?
(a) Real and inverted (b) Virtual and upright
(c) Enlarged and virtual (d) Real and upright
(e) No image formed

68. A molecule of water consists of two types of atoms. How many hydrogen atoms are there in one molecule of water?
(a) 1 (b) 2 (c) 3
(d) 0 (e) 4

69. Fire extinguishers commonly use a specific gas to suppress fires by cutting off oxygen supply. Which gas is typically used in standard fire extinguishers?

(a) Oxygen (b) Hydrogen (c) Carbon dioxide
(d) Nitrogen (e) Helium

70. The periodic table is categorized into several groups, including noble gases. These gases are known for their chemical inertness due to a full valence shell. Which of the following is a noble gas?

(a) Nitrogen (b) Oxygen (c) Neon
(d) Hydrogen (e) Carbon dioxide

71. Among the planets in our solar system, some have a much higher number of natural satellites or moons than others. Which planet currently has the most confirmed moons?

(a) Earth (b) Mars (c) Jupiter
(d) Saturn (e) Uranus

72. Pressure is a physical quantity that represents the force applied per unit area. In the SI system, what is the standard unit used to measure pressure?

(a) Pascal (b) Newton (c) Joule
(d) Tesla (e) Watt

73. Certain gases in Earth's atmosphere trap heat and contribute to the greenhouse effect. These are known as greenhouse gases. Which of the following is NOT considered a greenhouse gas?

(a) CO_2 (b) CH_4 (c) N_2
(d) H_2O (vapour) (e) O_3

74. Myopia, also known as nearsightedness, is a common vision condition. It is corrected using a specific type of lens that diverges light rays before they enter the eye. What type of lens is used to correct myopia?

(a) Convex (b) Concave (c) Plano-convex
(d) Cylindrical (e) Bifocal

75. According to the electronic configuration rules, each shell can hold a maximum number of electrons. What is the maximum number of electrons that can be accommodated in the third shell (M shell)?

(a) 2 (b) 8 (c) 18
(d) 32 (e) 10

76. Phenolphthalein is a common acid-base indicator used in titrations. When added to a basic solution, it exhibits a color change. What is the color of phenolphthalein in a basic medium?

(a) Colorless (b) Pink (c) Yellow
(d) Red (e) Blue

77. Ohm's Law is a fundamental law in electronics that defines the relationship between voltage, current, and resistance in a conductor. What does this law state?

(a) Newton's Law (b) Ohm's Law
(c) Faraday's Law (d) Ampere's Law
(e) Coulomb's Law

78. Sodium is an element represented by a chemical symbol in the periodic table. What is the correct symbol for Sodium?

(a) So (b) Sm (c) Na
(d) Sd (e) S

79. Light travels at an extremely high speed, particularly in a vacuum where there is no medium to slow it down. What is the approximate speed of light in a vacuum?

(a) 3×10^6 m/s (b) 3×10^8 m/s
(c) 3×10^{10} m/s (d) 3×10^7 m/s
(e) 3×10^5 m/s

80. The ozone layer is an important part of Earth's atmosphere. It protects living organisms from harmful ultraviolet radiation. What makes ozone effective in absorbing UV rays?

(a) Strong molecular bonds
(b) Weak bonds that allow UV absorption
(c) Large molecular mass
(d) High reflectivity
(e) UV refractive properties

81. Imagine being reduced to a billionth of your normal size and placed on a sheet of rough paper. What do you expect to observe from that microscopic perspective?

(a) A perfectly smooth plain
(b) A rough and rugged terrain
(c) A grid of atoms
(d) A slippery slope
(e) A flat landscape

82. You are provided two transparent liquids—one is water and the other is sugar solution. Which of the following techniques can help distinguish between them without tasting?

(a) Ant test (b) Lemon test (c) Float test
(d) Boil test (e) All of the above

83. A car accelerates from rest to a speed of 25 m/s over a span of 10 seconds. If the acceleration is constant, what is its rate of acceleration?

(a) 2.5 m/s^2 (b) 5 m/s^2 (c) 1.5 m/s^2
(d) 2 m/s^2 (e) 3 m/s^2

84. An object is thrown vertically with a certain velocity. What is the time taken to reach maximum height if the initial velocity is 20 m/s and acceleration due to gravity is 10 m/s^2 downward?

(a) 1 s (b) 2 s (c) 3 s
(d) 4 s (e) 5 s

85. How many distinguishable 4-letter words can be made from the letters of the word 'EXAM' without repeating any letter?

(a) 24 (b) 120 (c) 60
(d) 12 (e) 6

86. An arithmetic progression has first term a = 5 and common difference d = 3. What is the 20th term of this sequence?

(a) 62 (b) 65 (c) 57
(d) 64 (e) 66

87. If $\log_a(b) = x$ and log_b(c) = y, find $\log_a(c)$ in terms of x and y.

(a) xy (b) x + y (c) y / x
(d) x / y (e) None of these

88. Two particles are moving towards each other with velocities of 5 m/s and 7 m/s respectively. They collide elastically. What is the relative speed of separation after collision?

(a) 12 m/s (b) 6 m/s (c) 2 m/s
(d) 10 m/s (e) 14 m/s

89. In a DNA molecule, which base pairs with thymine through hydrogen bonding?

a) Guanine (b) Cytosine (c) Adenine
(d) Uracil (e) None of these

90. Which of the following logical statements is always true?

(a) $A \land \neg A$ (b) $A \lor \neg A$ (c) $A \Rightarrow A$
(d) $\neg(A \land A)$ (e) $A \Leftrightarrow \neg A$

91. A die is rolled three times. What is the probability that at least one 6 appears?

(a) 1/6 (b) 5/6 (c) 91/216
(d) 125/216 (e) $1 - (5/6)^3$

92. A train travels 120 km in 2 hours and then 180 km in 3 hours. What is its average speed over the entire journey?

(a) 60 km/h (b) 65 km/h (c) 70 km/h
(d) 75 km/h (e) 72 km/h

93 In a logical puzzle, three people make statements: A says B is lying, B says C is lying, and C says A is lying. Only one is telling the truth. Who is it?

(a) A (b) B (c) C (d) All are lying
(e) Cannot be determined

94. Which part of the brain is primarily responsible for maintaining balance and coordination?

(a) Cerebrum (b) Medulla (c) Hypothalamus
(d) Cerebellum (e) Pituitary

95. A Venn diagram includes sets of people who like Deep Learning, Artificial Intelligence, and Computer Science. Which logical relation must hold true if all Deep Learning fans also like AI and all AI fans also like CS?

(a) $DL \subseteq AI \subseteq CS$ (b) $CS \subseteq AI \subseteq DL$
(c) $AI \subseteq CS \subseteq DL$ (d) $CS \subseteq DL \subseteq AI$
(e) $DL \subseteq CS \subseteq AI$

96. Which of the following best explains the concept of entropy in thermodynamics?

(a) Degree of disorder in a system
(b) Capacity to do work
(c) Measure of internal energy
(d) Rate of heat flow
(e) Heat required to raise temperature

97. In a probability game, you toss two fair six-sided dice. What is the probability that the sum of the two dice is equal to 7?

(a) 1/6 (b) 1/12 (c) 1/36
(d) 5/36 (e) 7/36

98. In a logical deduction, the contrapositive of a statement 'If it rains, then I take an umbrella' is most accurately represented by which of the following?

(a) If I take an umbrella, then it rains
(b) If it doesn't rain, I don't take an umbrella
(c) If I don't take an umbrella, it doesn't rain
(d) If I don't take an umbrella, then it doesn't rain
(e) If I don't take an umbrella, then it didn't rain

99. In combinatorics, how many ways can 3 identical balls be placed in 4 distinct boxes?

(a) 10 (b) 20 (c) 15 (d) 18 (e) 12

100. A sequence follows the rule $a_n = 2a_{\{n-1\}} + 1$ with $a_1 = 1$. What is the value of a_4?
(a) 15 (b) 11 (c) 9 (d) 13 (e) 17

101. A problem gives you a data interpretation table showing infection rates over five days. If the number of infected people doubled every day from Day 1 (starting at 100), how many were infected by Day 5?
(a) 800 (b) 1600 (c) 3200 (d) 1200 (e) 3000

102. In a coding system, each vowel is replaced with the digit 1 and consonants with 0. What is the code for the word 'CODES'?
(a) 01010 (b) 01001(c) 00101 (d) 11000 (e) 10101

103. Which of the following graphs best represents a function that increases exponentially?
(a) A straight line (b) A parabolic curve
(c) A rapidly rising curve (d) A sinusoidal curve
(e) A logarithmic curve

104. A logical reasoning puzzle gives a table of people who like AI, Deep Learning, and Computer Science. If every Deep Learning fan also likes AI, and every AI fan also likes Computer Science, what is the correct Venn diagram relationship?
(a) $DL \subseteq AI \subseteq CS$ (b) $CS \subseteq AI \subseteq DL$
(c) $AI \subseteq CS \subseteq DL$ (d) $CS \subseteq DL \subseteq AI$
(e) $DL \cup AI \subseteq CS$

105. You are presented with a 3D geometry problem where 8 points are connected in space and certain pairs are constrained to be equidistant. If coordinates of point P_6 are known, how many more variables do you need to define all points completely?
(a) 13 (b) 10 (c) 24 (d) 16 (e) 19

106. A pendulum with time period T is moved from Earth to a planet where gravity is a million times stronger. How does its time period change on the new planet?
(a) T/1000 (b) 1000T (c) T/100 (d) $\sqrt{10}$ T
(e) T remains unchanged

107. During a science experiment, it is observed that as you zoom in on a piece of used notebook paper to the nanoscale, the surface is not flat but appears like a rough terrain. What is this an example of?
(a) Smooth material surface
(b) Paper's microstructure
(c) Flat crystalline layer
(d) Atomic lattice structure
(e) Microscopic absorption

108. If a company's structure is such that each manager supervises exactly two employees, and only bottom-level workers have no subordinates, what fraction of the company's employees are at the bottom level?
(a) ½ (b) 1/3 (c) ¼ (d) 2/3 (e) 1/5

109. A man is facing north. He turns 45° clockwise, then another 180° in the same direction and finally 270° counterclockwise. What direction is he facing now?
(a) North (b) South (c) West
(d) East (e) South-East

110. If in a certain language, 'LEMON' is coded as 'NEMOL', then how would 'APPLE' be coded in the same language?
(a) ELPPA (b) LEPPA (c) EPLPA
(d) PAPLE (e) PELPA

111. A series is given with one term missing. Choose the correct alternative: 3, 6, 18, 72, ?
(a) 144 (b) 288 (c) 360
(d) 216 (e) 432

112. Statement: All books are papers. All papers are pencils. Conclusion: (I) All books are pencils. (II) All pencils are books.
(a) Only I follows (b) Only II follows
(c) Both I and II follow (d) Neither I nor II follows
(e) Cannot be determined

113. Find the missing number in the following series: 5, 11, 24, 51, ?, 213
(a) 102 (b) 106 (c) 110
(d) 108 (e) 112

114. Which number comes next in the series: 121, 144, 169, 196, ?
(a) 216 (b) 225 (c) 256
(d) 289 (e) 324

115. If COMPUTER is coded as RFUVQNPC, how will MEDICINE be coded?
(a) MFEDJJOE (b) EOJDJEFM (c) MFEJDJOE
(d) EOJDJJFM (e) None of these

116. What should come in place of the question mark: ACE, BDF, ?, DHL, EJQ
(a) CFI (b) CEH (c) ADG
(d) BEG (e) CFH

117-121. Serbo-Croatian is a Slavic language spoken in Bosnia and Herzegovina, Croatia, Montenegro, and Serbia. Below is a list of words in Serbo-Croatian along with their meanings. Use the data to answer the questions that follow.

Serbo-Croatian Word	Meaning
Svirati	to play (infinitive)
Diram	I touch
Gledanje	the watching
Gledaju	they watch
Stanujem	I live
Stanovati	to live (infinitive)
Kupuju	they buy

Serbo-Croatian Word	Meaning
kupujem	I buy
kupovanje	the buying
nazivati	to call (infinitive)
sviram	I play
gledam	I watch
gledati	to watch (infinitive)
stanuju	they live

117. Translate the sentence: “I play” ?

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118. Translate the sentence: “They watch” ?

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119. Translate the phrase: “To buy” (infinitive) ?

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120. Translate the sentence: “I live” ?

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121. Translate the phrase: “The calling” ?

DETAILED SOLUTIONS

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IIITPREP

UGEE 2025 SOLUTION

DISCLAIMER

This memory-based paper is compiled from student recollections of the UGEE 2025 exam. While the **actual exam had 90 questions**, this set contains more than 90 Questions due to **varied recall and interpretation**. It is meant for practice only and is not an official paper.

IIITprep
PREPARE FULLY FOR IIIT HYDERABAD

THE LAST MINUTE BEFORE EXAM

UGEE HAS MAINLY EASY QUESTIONS, TRY TO SOLVE THE QUESTION WITH SPEED AND DON'T SPEND MORE TIME ON A SINGLE QUESTION OR DON'T STICK ON ANY QUESTION. AS THERE WILL BE FEW LENGTHY QUESTIONS IN BETWEEN THE PAPER, THE ONE WHO WILL IDENTIFY IT AND WILL LEAVE WILL WIN.

HERE ATTEMPTED NUMBER OF QUESTIONS IS MORE IMPORTANT BECAUSE EVERY QUESTION COVERS YOUR SAME MARKS. HERE YOU MUST HAVE TO BE SMART. YOU MUST COVER MOST QUESTIONS FOR THE EXAM. THE LAST-MINUTE IS FOR PRACTICING PAPERS ONLY. THIS WILL GIVE YOU SPEED, ACCURACY, ETC. YOU WILL GET TO KNOW ABOUT THE ACTUAL EXAM CONDITION AND THE MISTAKE WHICH CAN HAPPEN WITH YOU. YOU MUST ATTEMPT FREE ONLINE PAPERS BASED ON THE UGEE PATTERN AND OF THE SAME DIFFICULTY LEVEL ON OUR WEBSITE IIITPREP.COM YOU WILL GET TO KNOW ABOUT THE DETAILS ANALYSIS WITH SOLUTIONS.

AFTER THE EXAM YOU CAN HELP THIS COMMUNITY BY SHARING MEMORY BASED QUESTIONS ON WHATSAPP 7972348944 OR ON WEBSITE, AS A RESULT BY VARIOUS OTHER SOURCES, THE QUESTION WILL BE VERIFIED AND PRIZES FOR ALL THE CORRECT ONES WILL BE GIVEN TO THEM THROUGH COURIER AT THEIR DOORSTEP. THE MORE THE NUMBER OF CORRECT QUESTIONS YOU WILL SHARE, THE MORE THE BIG PRICE YOU WILL GET.

AFTER THE ANNOUNCEMENT OF THE RESULT, SEND YOUR SCREENSHOT OR PDF OF YOUR REPORT / RESULT ON WHATSAPP NUMBER 7972348944 ALL THE SELECTED STUDENTS WILL BE GIVEN OTHER **INTERVIEW PREPARATION MATERIALS**, VIDEOS, LECTURES FOR FREE. SPECIAL GUIDANCE ABOUT INTERVIEW WILL BE PROVIDED ONLY FOR THE SELECTED STUDENT FOR FREE OF COST.

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IMPORTANT POINTS ABOUT EXAM

1. On Screen **Calculator** was provided in **2020/21** but No guarantee of calculator in this year, it **may or may not be provided** depends on IIITH Authority
2. You will get Multiple choice Question in REAP Section (Consisting of SUPR Topics) means **more than one option correct Question** so, be careful don't make them to go in negative.
3. Last Year SUPR was having 50 Questions of Level of questions were easy but this doesn't means that paper will be easy. What if?, you got only 40 questions in SUPR? Then it will be little difficult So, Don't Panic, keep your Accuracy because finally **accuracy and time** will be the important factors in SUPR Section.
4. Important Topic is **Probability and Permutation & Combination** which is common in both the Section SUPR & REAP
5. In REAP Section there will be Questions based on logical thinking but core concepts will be of Physics, Chem and Math's which is mentioned as Basic **SUPR Questions Chapter in IIITprep REAP Book** so, These Questions will look little difficult but they can be solved, lol !
6. For Linguistics questions you may get options or match the column but be ready also to type **answer in the box**. You will get the instructions there for writing the answer in the correct form. Do read it carefully
7. There will be **some questions on partial marking** so, do read the marking scheme of some specific section carefully. **Partial Marking specifically for Linguistics and MCQ questions**.
8. Do attempt all questions of SUPR if there is no negative marking before 3:00 PM because last year, **you were not allowed to go back to SUPR section from the REAP sections** means that was locked automatically.
9. You will get proper time in REAP but, in that section, IIITH has a tendency to show you so **much big questions** where you have to scroll 3-4 times like that of linguistics questions in the Mock Tests but be smart
10. In the Exam, Overconfidence will ruin all your efforts so, **Be stable & calm** whatever be the paper easy or difficult. You will get enough time specially for REAP section so, just keep the Accuracy.

Remember: If the paper is easier then it's easier for almost ALL and if it's difficult then it will be difficult for many so, don't worry. Just focus to solve as many correct questions as you can in the exam

ALL THE BEST !